Air and Gas Lift Number

15 Cents a Copy

The OIL and GAS JOURNAL

PRODUCING REFINING MARKETING

Published Every Thursday TULSA, OKLAHOMA, OCTOBER 20, 1927 $6.00 a Year

OCT 21 1927

Cleaver-John Library E5145-L-12-31-4

Rendering a Vital Service

with a full recognition of the responsibilities involved

While the Halliburton Oil Well Cementing Company is a private commercial organization, it renders an important public service. Consequently it holds itself to the same rigid service standards as a public utility corporation.

• • •

In the discharge of their duties, Halliburton engineers have disregarded clock and calendar. They have never hesitated to work Sundays, holidays and far into the night when the occasion demanded.

• • •

They have reached destinations under conditions that seemed too severe even to attempt to overcome. "We'll Get There Somehow" is their motto; they have never failed to live up to it.

They have provided hundreds of well operators with the highest measure of protection it was possible to give their heavy investments—a scientifically placed wall of impervious cement, serving as an everlasting barrier to such hazards as the intrusion of upper water, shifting formations, corrosion, migration of fluids and collapse of casing through external pressures, to cite just a few.

• • •

They have saved *entire fields* from encroachment of water, barrenness and eventual abandonment.

• • •

It is doubtful if any single organization in existence has done more to preserve the petroleum resources of the nation.

An interesting booklet telling more about this service will be mailed on request.

HALLIBURTON

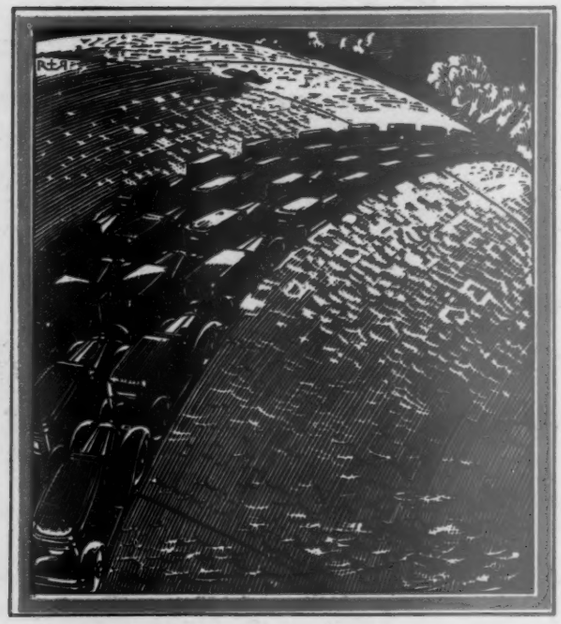
OIL WELL CEMENTING CO.

Duncan, Oklahoma

Advertisers' Index on Page 33 Table of Contents on Page 34

London speaking. . .

We want 1000 cars



THE MANAGING DIRECTOR of a motors company in London talked with an automobile factory in the American Middle West and ordered a thousand cars. Amount involved, $1,500,000. Communication was over the regular long distance lines, and by radio telephone across the Atlantic. Delivery dates and other details were arranged; business conditions of the moment were discussed.

"I HAD URGENT NEED yesterday,' writes a London barrister, "to confer with a brother lawyer in New York. . . . The conference was disposed of satisfactorily in 3 minutes."

A New York department store sold so much of a certain silk that it had to know whether more could be shipped from London immediately. More was quickly ordered by transatlantic telephone.

"I cannot resist letting you know," writes the president of another American company, "the result of a telephone call with London this morning. . . . It was the thrill of a lifetime. . . . And it's wonderful how much conversation can be crowded into a four or five minute talk."

Use transatlantic service for business and social calls. It's simplicity itself. Just ask for "Long Distance" and place your call in the usual way. . . . . *Number, please?*

BELL LONG DISTANCE SERVICE

B
B
B
B
B
B
B
B
B
B
B
B
B
Be
Be
Be
Be
Be
Bi
Bi
Bl
Bo
Bo
Br
Br
Br
Br
Br
Br
Br
Br
Bu
Bu
Bu
Bu
Bu
Bu
Bu
Bu
Bye
Byr

Cal
Car
Car
Car
Car
Cat
Celi
Cen
Cen
Cha
Cha
Cha
Cha
Che
Chic
Chic
Chis
Clar
Clas
Clim
Coff
Colu
Colu
Cont
Cont
Cook
Cook
Coop
Cran
Cran
Cres
Crow

The ADVERTISERS' INDEX

A

Acme Fishing Tool Co.
Ajax Iron Works
Ajax Rope Co. 205
Allegheny Steel Co.
Allis-Chalmers Mfg. Co. 135
Aluminum Co. of America
Amarillo Abstract Co. 207
Amarillo Hotel 207
American Cable Co., Inc.
American Car & Foundry Co.
American Hammered Piston Ring Co.
American Institute of Mining and Metallurgical Engineers 204
American Manganese Steel Co. 183
American Radiator Co. 27
American Roller Bearing Co. 194
American Rolling Mill Co.
American Schaeffer & Budenberg Corp.
American Sheet & Tin Plate Co.
American Spiral Pipe Works
American Telephone & Telegraph Co. ....Inside Front Cover
American Well Works
Andrews Steel Co. 191
Arco Company, The 2
Armstrong Bros. Tool Co. 205
Association of Natural Gasoline Mfgrs.
Athey Truss Wheel Co.
Austin Co.
Axelson Machine Co. 125

B

B. & A. Specialty Co. 184
Baash-Ross Tool Co.
Babcock & Wilcox Tube Co., The
Baker Casing Shoe Co. 4
Baker-Lockwood Mfg. Co.
Baldwin Chain & Mfg. Co.
Barber Asphalt Co.
Barber-Greene Co.
Barco Manufacturing Co. 131
Barnickel, Wm. S., & Co. 204
Barnsdall Refineries, Inc.
Barrett, G. E., & Co.
Bartlesville Supply Co. 143
Beaumont Iron Works Co.
Becker Specialty Co.
Benjamin Electric Mfg. Co.
Bessemer Gas Engine Co. 111
Bethlehem Steel Co.
Biggs Boiler Works Co.
Bignall & Keeler Machine Works 28
Blaw-Knox Co.
Borden Co. 192
Bovaird Supply Co., The 147
Braden Steel & Winch Co.
Braun, C. F., & Co. 177
Bristol Co.
Broderick & Bascom Rope Co. 67
Brooks Engineering Corp.
Brown, Arthur C. 207
Brown Instrument Co. 189
Brownell Co. 203
Buckeye Traction Ditcher Co. 186
Buda Co.
Buffalo Bolt Co.
Buffalo Gasolene Motor Co.
Burns Tool Co.
Burt Corp.
Burt Mfg. Co. 190
Butler Mfg. Co. 32
Byers, A. M., Co.
Byron Jackson Pump & Mfg. Co., Inc... 8

C

California Pipe Line Machine Co. 190
Cameron Iron Works
Campbell, J. A. 139
Canadian Pacific Railway Co.
Carbondale Machine Co.
Caterpillar Tractor Co.
Celite Products Co.
Central Alloy Steel Corp.
Central Tube Co. 203
Chain Belt Co.
Champion Machine & Forging Co.
Chaplin-Fulton Mfg. Co. 202
Chapman Valve Mfg. Co.
Chestnut & Smith Corp.
Chicago Bridge & Iron Works 179
Chicago Pneumatic Tool Co. 78
Chisholm-Moore Mfg. Co.
Clark Bros. Co. 84-85
Classified Wants 156-157
Climax Engineering Co.
Coffey & Warner 206
Columbian Rope Co.
Columbus Forge & Iron Co. 205
Continental Motors Corp.
Continental Supply Co. 81-121
Cook Motor Co., The
Cooke Seal Ring
Cooper, C. & G., Co. 98-99
Crane Co. 77
Crane Packing Co. 196
Crescent Belt Fastener Co.
Crown Central Petroleum Corp.

D

D. & B. Pump & Supply Co. 25
Darling Valve & Mfg. Co.
Dart, E. M., Mfg. Co.
Davis, G. M., Regulator Co. 133
Dayton Pipe Coupling Co.
Dearborn Chemical Co.
De La Vergne Machine Co.
Delta Electric Co.
Detex Watchclock Corp. 204
Detroit Graphite Co.
Diamond Drill Carbon Co. 206
Dixon, Joseph, Crucible Co.
Donovan Boiler Works, Inc.
Dresser, S. R., Mfg. Co. 45
Dunn Mfg. Co. 49
DuPont de Nemours & Co., E. I., Inc...

E

Eagle-Picher Lead Co.
Eastern Torpedo Co.
Edward Valve & Mfg. Co.
Elliott Core Drilling Co. 201
Empire Refineries, Inc.
Emsco Derrick & Equipment Co.
Ethyl Gasoline Corp.
Exchange National Bank

F

Fairbanks-Morse & Co.
Federal Supply Co.
Fenwick-Reddaway Mfg. Co.
Fernholtz Machinery Co. 203
Fisher Governor Co. 107
Foamite-Childs Corp.
Fohs, F. Julius
Foos Engine Co.
Ford Chain Block Co. 198
Foster Wheeler Corp. 136
Foxboro Co., Inc., The 118
Franklin Valveless Engine Co.
Frick-Reid Supply Co. 187

G

Gardner-Denver Co.
Garlock Packing Co. 188
Gasoline Recovery Corp.
Gaso Pump & Burner Mfg. Co. ....Inside Back Cover
General American Tank Car Corp.
General Asbestos & Rubber Co.
General Electric Co. 114
Gilbert & Barker Mfg. Co. 181
Goodrich, B. F., Rubber Co.
Goodyear Tire & Rubber Co.
Gott, H. P., Mfg. Co. 206
Goulds Pumps, Inc. 113
Graham Brothers
Graver Corp. 61
Gray Processes Corp.
Greenspon's, Joseph, Sons, Iron & Steel Co. 199
Griscom-Russell Co. 82
Guiberson Corp. 195
Gulf Refining Co. 30
Gustin-Bacon Mfg. Co.

H

Halliburton, Erle P., Co.
Halliburton Oil Well Cementing Co. ....Front Cover
Harrisburg Pipe & Pipe Bending Co.
Haynes Stellite Co. 23
Hazard Wire Rope Co.
Heppenstall Forge & Knife Co. 199
Hercules Motors Corp.
Hercules Tool Co.
Heydrick Mapping Co. 207
Hill, Hubbell & Co.
Hills-McCanna Co. 202
Hinderliter Tool Co.
Homestead Valve Mfg. Co.
Hoover Steel Ball Co.
Hope Engineering & Supply Co. 108
Hopkins, Edwin B. 207
Hough, Charles N., Mfg. Co.
Hoyt Metal Co. 201
Hughes Tool Co. ....Back Cover
Humble Oil & Refining Co.
Hunt, Robert W., Co.

I

Imperial Belting Co. 197
Imperial Brass Mfg. Co., The
Imperial Royalties Co. 206
Indiana Truck Corp.
Ingersoll-Rand Co. 123
International Derrick & Equipment Co...
International Harvester Co. of America
International Nickel Co.
International Supply Co.

J

Jackson Engineering & Equipment Co...
Jarecki Mfg. Co.
Jefferson Union Co. 117
Jensen Brothers Mfg. Co.
Johns-Manville Corp.
Jones, J. Edward 205
Jones, S. M., Co. 2

K

Kaw Steel Construction Co. 15
Kellogg, M. W., Co. 65
Kelly, John Eoghan
Kelly, Kork 207
Kennedy Valve Mfg. Co.
Kerotest Mfg. Co. 96
Keuffel & Esser Co. 206

L

Landis Machine Co. 3
Larkin & Co. 10
Layne & Bowler Co.
Leader Iron Works
Leidecker Tool Co.
Leschen, A., & Sons Rope Co.
Lientz, B. P., & Co. 26
Lincoln Electric Co.
Linde Air Products Co. 1
Link-Belt Co. 14
Longyear, E. J., Co.
Lorraine Corp., The
Lubrikup Co., Inc.
Lucey Mfg. Corp.
Ludlow Valve Mfg. Co. 134
Lufkin Fdy. & Machine Co. 56
Lufkin Rule Co.
Lunkenheimer Co.

Mc

McCord Radiator & Mfg. Co. 130
McGregor Working Barrel Co. 205
McIntosh & Seymour Corp.
McKee, Arthur G., & Co.

M

M. & M. Mfg. Co., The
Macwhyte Co.
Madison-Kipp Corp. 133
Magnolia Petroleum Co.
Maloney Tank Mfg. Co. 151
Manzel Brothers Co.
Marion Machine Fdy. & Supply Co.
Marsh Gauge Pole Co. 204
Mason Regulator Co. 137
Master Builders Co.
Mathieson Alkali Works, Inc.
Merco Nordstrom Valve Co. 89
Metric Metal Works
Midwest Piping & Supply Co.
Miller Improved Gas Engine Co. 126
Mission Sales Co.
Moon Mfg. Co.
Moore, Lee C., & Co., Inc. 75
Moore Drop Forging Co.
Munn & Co. 207
Myers, F. E. & Bro., Co. 206

N

National Carbon Co., Inc. 1
National Lead Co.
National Petroleum Engineering Co. ..207
National Supply Co. 104-105
National Transit Pump & Machine Co... 53
National Tube Co.
Nellan, Shumacher & Co. 129
Newton Process Mfg. Co. 43
Norris Brothers, Inc. 144
Norris, W. C.
North American Car Corp.
Northern Fire Apparatus Co.
Novo Engine Co. 19
Nuttall, R. D., Co. 7
Nye Tool & Machine Works

O

Oakite Products, Inc. 145
O'Brien Steel Construction Co. 155
Ohio Injector Co., The 101
Oil City Iron Works (Corsicana)
Oil City Iron Works, Inc. (Shreveport)..
Oil Conservation Engineering Co.
Oil Country Specialties Mfg. Co.
Oil Insurance Association 153
Oil Well Improvements Co., The
Oil Well Supply Co. 71
Oklahoma Gas & Electric Co.
Oklahoma Portland Cement Co.
Oxweld Acetylene Co. 1

P

Page Steel & Wire Co. 140
Paige & Jones Chemical Co., Inc. 31
Parkersburg Machine Co.
Parkersburg Rig & Reel Co. 18
Patrick, R. S. 197
Pattin Brothers Co.
Pelican Well Tool & Supply Co.
Penberthy Injector Co. 198
Petroleum Appliance Co.
Petroleum Iron Works Co. 11
Pforzheimer, Carl H., & Co. 198
Philadelphia Gear Works 153
Phillips Petroleum Co.
Pittsburgh-Des Moines Steel Co. 141
Pittsburgh Equitable Meter Co. 132
Pittsburgh Pipe Coil & Bending Co.
Pittsburgh Steel Products Co.
Powell, William Co. 205
Power Mfg. Co., The 205
Power Piping Co. 200
Power Plant Equipment Co.
Prescott Co., The
Prest-O-Lite Co., Inc., The 1
Pure Oil Co. 6
Pyle National Co.

Q

Quaker City Rubber Co.
Quigley Litho Co. 207

R

Ratigan, J. P., Co.
Reading Iron Co.
Reading Steel Casting Co., Inc.
Reed Roller Bit Co. 31
Regan Forge & Engineering Co. 185
Reid, Joseph, Gas Engine Co. 73
Reo Motor Car Co. 69
Republic Iron & Steel Co. 142
Republic Supply Co. 193
Ridge Tool Co.
Riehle Bros. Testing Machine Co.
Riter-Conley Co. 203
Robinson Orifice Fitting Co.
Rock Island Plow Co.
Roots, P. H. & F. M., Co.
Ross-Meehan Foundries
Ryerson, Joseph T., & Son, Inc. 207

S

Safety Gas Main Stopper 207
Safety Pulling Machine Co.
Shaffer, J. E., Co.
Shaffer Tool Works
Shaw, S. F. 207
Sheffield Steel Corp. 155
Sinclair Refining Co. 167
Sivyer Steel Casting Co.
Skelly Oil Co.
Skinner, M. B., Co. 202
Smith, A. O., Corp. 17
Smith Separator Co. 102
Smooth-On Mfg. Co.
Sonner, P. J., Gas Burner Co.
South Chester Tube Co.
Southern Cornice Works
Southwestern Engineering Corp. 181
Spang & Co. 20
Spang, Chalfant & Co., Inc. 24
Spence Machine Co.
Standard Rail & Steel Co.
Stanley Belting Corp.
Star Drilling Machine Co.
Stayton, Geo. K. 207
Stearns-Roger Mfg. Co.
Steiner, George
Strom Steel Ball Co. 182
Sullivan Co., The
Sullivan Machinery Co. 200
Sweet, Wm. J., Foundry Co.

T

Taubman Supply Corp.
Taylor Instrument Companies
Templeton, Kenley & Co., Ltd.
Texas Company, The 12
Texas Creosoting Co.
Texas Pacific Coal & Oil Co.
Texas Steel Co.
Timken Roller Bearing Co. 13
Titusville Forge Co.
Titusville Iron Works 93
Toledo Pipe Threading Machine Co. 127
Traction Machine Co., The 194
Trimont Mfg. Co. 9
Trumble Gas Trap Co.
Tulsa Sheet Metal Co.
Twin Disc Clutch Co.

U

United Iron Works, Inc. 23
United States Cast Iron Pipe & Fdy. Co.
United States Industrial Diamond Corp..206
Universal Oil Products Co. 51

V

Victaulic Co. of America 202
Victor Balata & Textile Belting Co.
Vogt, Henry, Machine Co.

W

Wagner Electric Corp.
Wailes Dove-Hermiston Corp. 207
Walsh & Weidner Boiler Co.
Walworth Co.
Wasburne, Chester W. 207
Waukesha Motor Co.
Westcott & Greis 58
Westinghouse Electric & Mfg. Co. 94
Whealton & Townsend, Inc.
Wheeling Steel Corp.
Wickwire Spencer Steel Co.
Wico Electric Co. 6
Widdell Engineering Co.
Williams, J. H., & Co.
Williamsport Wire Rope Co.
Williams Tool Corp.
Wilson Oil Tools Corp.
Wilson-Snyder Mfg. Co.
Witte Engine Works
W-K-M Company, Inc.
Worthington Pump & Machinery Corp. 90-91
Wright Mfg. Co.

Y

Yale & Towne Mfg. Co.
Young Engine Corp.

Z

Zero Hour Torpedo Co. 128
Zwetsch Heinzelmann & Co. 204

The OIL and GAS JOURNAL

PRODUCING REFINING MARKETING

VOL. 26. NO. 22 TULSA, OKLAHOMA, OCTOBER 20, 1927

The Petroleum Publishing Co.
Copyright, 1927, by

TABLE OF CONTENTS

SPECIAL ARTICLES

Sharp Decline at Seminole Expected 35
By Andrew M. Rowley
West Texas goes above 200,000-bbl. mark. South America an important factor and deserving of attention.

Engineers Consider Gas Situation 37
By Thomas F. Smiley
Co-operative agreements and approved practices discussed by experts.

Institute Urged to Name Committee on Conservation 37
By Charles E. Kern

America's Policy on Exports of Oil 38

Has the Turning Point Been Reached? 38
By E. B. Reeser
Decline in Seminole causing discussion of next field.

Survey of Petroleum Situation Abroad 39

The Oil Problem, Causes and Remedies 40
By F. C. Proctor
Regulation by commission unworkable. Government's proper work.

Principles of Air-Gas Lift Practice 42
By H. R. Pierce and James O. Lewis
Methods explained and sources of error in data collected.

After Seminole—What? (Editorial) 44

Additional Rate Increases 50
By C. O. Willson

Air-Gas Lift Practice in Seminole 75
By S. F. Shaw
Major part of production procured by this method.

Mechanical Apparatus for Gas Lift 83
By J. L. Dwyer

Gas Lift Pumping in California 88
By H. C. Miller
Mechanical installations in Pacific Coast Fields.

Air Lift in Gulf Coast Areas 92
By L. L. Brundred
Will probably be of great aid to operators.

Compressors Success in Old Fields 95
By James McIntyre

Back Pressure and Ultimate Recovery 100
By E. O. Bennett
Gas lift properly applied will increase total production.

Seminole Air Gas Lift Installations 109
By Clifton R. Swartz
Mechanical features and methods of application.

Effect of Gas Lift on Oil Uncertain 112
By R. R. Brandenthaler
Conflicting opinions held as to effect on gravity.

Mechanical Installations of Gas Lift 115
By E. V. Foran
Factors in production in Texas other than Gulf Coast.

Gas Factor and Production Efficiency 116
By Lestern C. Uren
Variables which influence it as measure of effectual operation.

Paraffin Troubles in Eastern Fields 119
By Frank M. Brewster
Patented process of burning has given best results.

Problems in Handling Panhandle Oils 120
By W. V. Vietti and W. A. Oberlin
Paraffin forms protective coating and reduces corrosion.

Air Gas Lift and Ultimate Output 122
By F. W. Lake
Relation to gas-oil ratios in light of California data.

Handling Congealing Oil and Paraffin 124
By C. E. Reistle, Jr.
Summary of existing information on subject.

Speculating on Seminole's Finish 154
By James McIntyre

FIELD OPERATIONS

North and West Texas, *By C. D. Lockwood* 46
Late Fields 47
Texas Panhandle, *By Staff Correspondent* 48
Oklahoma, *By J. L Dwyer* 52
East Central Texas, *By Staff Correspondent* 52
Kansas, *By J. L. Dwyer* 54
North Louisiana-Arkansas, *By Neil Williams* 55
Gulf Coast, *By James H. Dameron* 57
Southwest Texas, *By B. D. Stevenson* 59
Rocky Mountain Area, *By Tolbert R. Ingram* 60
Canada, *By Victor Lauriston* 62
California, *By L. P. Stockman* 47-62
Central West, *By Whit* 66
Eastern Fields, *By D. S. Wakenight* 68
Kentucky-Tennessee, *By Whit* 68

REFINING AND MARKETING

Little Change in Refinery Markets 36
By W. T. Ziegenhain

Light Demand in Chicago Market 158
By J. B. Waldo

Eastern Refined Market Weak 159
By N. O. Fanning

Detection of Sulphur in Petroleum 160
By F. W. Lane and John M. Devine

Natural Gasoline as Domestic Fuel 178
By W. T. Ziegenhain

Of Interest to Sales Departments 180

Short Talks on Specifications 180
By W. T. Ziegenhain

Refining and Marketing News 162

Plant Operators' Page 163

Refinery and Crude Prices 164-165

Tank Wagon Quotations 166

Technical Questions Answered 176
By Dr. C. K. Francis

ARTICLES OF GENERAL INTEREST

The Advertisers' Index 33
Men Known in Oildom and Personals 70
Natural Gas Developments 72
Equipment and Supplies 74
Lightness in Steel Demand, *By B. E. V. Luty* 134
Classified Want Advertisements 156-157
Oil Securities Holding Own 168
Gasoline Tax Legislation, *By Edward Martin* 194
Crude Petroleum Statistics 208

BE A REGULAR READER

The OIL and GAS JOURNAL Tulsa, Okla.

You are hereby directed to mail The Oil and Gas Journal to me for.....year. Enclosed find remittance $.....

Classify my interests as checked by me.

.....Producing .....Refining
..... Equipment .. Marketing

Name .....
Address .....
City .....

$6 a Year
$3 6 Months

Refinery Section Starts on Page 158

Sharp Decline at Seminole Expected

Highest daily average estimated production in 1926, week ended Dec. 25, 2,385,139 bbls. Lowest in 1926, January 30, 1,915,900 bbls.

West Texas Goes Above 200,000-Bbl. Mark. South America an Important Factor and Deserving of Attention

By Andrew M. Rowley

Highest daily average estimated light oil production in 1926, week ended Dec. 25, 1,797,349 bbls. Lowest in 1926, Jan. 30, 1,371,600 bbls.

With the industry fairly well agreed a sharp decline in production of the greater Seminole area in Oklahoma is due to start in about five weeks, oil men already are beginning to turn their attention more and more to other sections of the country which promise to assume greater importance in the general situation as Seminole gradually fades from the limelight. West Texas is the focus of a major part of the interest and development in that section may be expected to increase as the output of Seminole drops and as additional facilities for handling production are provided. West Texas last week went over the 200,000-barrel-a-day-average mark and production there will continue to show increases as pipe lines are completed and storage tanks erected.

However, as has been pointed out frequently, there is a big difference in Seminole crude and that produced in the West Texas fields. The latter is not as desirable because of its sulphur content and West Texas will not wield the influence on the general price structure as did Seminole. A material falling off in output of Seminole is far more important than big gains in production in West Texas.

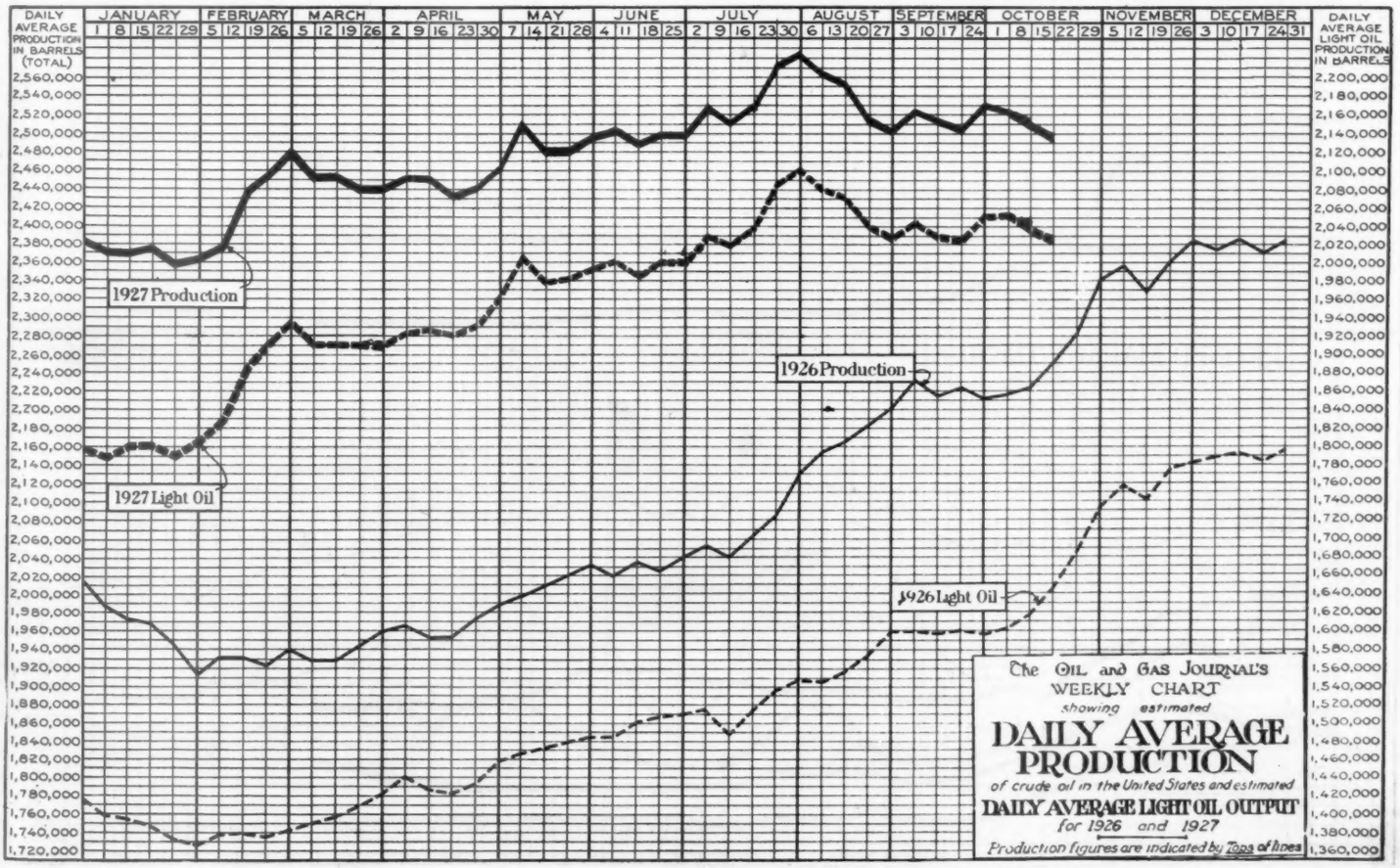
This is a good time for the entire industry to devote more attention to the situation in other countries, particularly South America. Venezuela is closer, by water route, to New York than Houston, Tex., and, as is pointed out in the survey of foreign oil fields published on page 39 of this issue, there is a production of 313,000 barrels a day shut in in Venezuela waiting facilities for handling it and bringing it to the United States. Every barrel of crude brought to this country from abroad has the effect of lessening the demand for domestic production to just that extent. South America is a most important factor in the situation in this country and, undoubtedly, will wield a greater influence within the near future.

PRODUCTION IN THE UNITED STATES

Estimated daily average production of light and heavy gravity oil in the United States for week ended October 15, and a comparison with the previous week follows:

	Oct. 15		Oct. 8	
Oklahoma—	**Light**	**Heavy**	**Light**	**Heavy**
Tonkawa	17,985	.....	18,730	.....
Burbank	34,960	.....	35,035	.....
Other Osage Fields	30,605	.....	30,710	.....
Cushing and Shamrock	21,255	.....	21,260	.....
Bristow and Eastern Bristow	24,815	.....	24,835	.....
Cromwell	11,580	.....	11,780	.....
Garber	10,320	.....	10,755	.....
Blackwell-Braman	8,830	.....	8,860	.....
Seminole	441,490	.....	453,710	.....
Wewoka	13,645	.....	14,020	.....
Northern Miscellaneous	111,730	.....	112,770	.....
Southern Fields	63,570	.....	66,105	.....
Total Oklahoma	790,785	.....	808,570	.....
North Louisiana	42,295	9,325	42,105	9,760
Arkansas	23,500	77,570	22,105	78,080
North Central Texas	145,250	.....	146,903	.....
West Texas	209,282	.....	195,765	.....
Texas Panhandle	89,295	.....	89,570	.....
East Central Texas	29,874	.....	31,084	.....
Kansas	104,735	.....	104,240	.....
Total Mid-Continent Area	1,435,016	86,895	1,440,342	87,840
Gulf Coast	.....	140,009	.....	138,355
Southwest Texas	.....	29,815	.....	29,997
Eastern	111,500	.....	111,000	.....
Rocky Mountain Area	72,249	.....	71,610	.....
California—				
Santa Fe Springs	38,500	.....	38,500	.....
Long Beach	92,000	.....	91,000	.....
Torrance	3,500	17,000	4,000	17,000
Huntington Beach	62,500	.....	64,000	.....
Dominguez	15,000	.....	15,000	.....
Rosecrans	8,000	.....	8,000	.....
Inglewood	21,000	12,000	21,000	12,000
Ventura Avenue	57,000	.....	56,750	.....
Seal Beach	60,000	.....	66,500	.....
Remainder of State	54,000	185,000	54,000	184,000
Total California	411,500	214,000	418,750	213,000
Total United States	2,030,265	470,719	2,041,702	469,192
Grand Total		2,500,984		2,510,894

Total Decrease, 9,910 Bbls.; Light Oil Decrease, 11,437 Bbls.



Little Change in Refinery Markets

Oklahoma Prices Reflect Continued Weakness in All Products Except Kerosene, Natural Gasoline and Wax

By W. T. Ziegenhain

Oklahoma refined oil prices showed but little change over the week. The market was generally weak with the exception of kerosene, natural gasolines and wax. The higher gravity refinery gasolines were moving at a good rate but there was plenty available and prices on these grades were generally a fraction under those of last week. The 58-60 U. S. Motor grade remained at last week's prices but there was a decided dullness in this market.

Although only a very few cars were shipped at prices below 6 cents, there was a tendency on the part of many refiners to shade the 6¼-cent price which they set as their minimum last week. Kerosene was in good demand but some refiners and marketers felt kerosene had about reached its top price or at least would not continue to rise as rapidly as has been the case over the past month.

The lower gravity kerosene was not in as strong demand as the higher gravity. Gas oil witnessed a better demand, both for use in cracking and as a fuel for domestic oil burners. The lower cold test, transparent, low flash gas oils were sold at prices from one-eighth to three-eighths cent above the ordinary grade.

Fuel oils were generally weak because of the lack of new buyers. Practically all of the fuel oil is now going to a relatively few consumers and is being taken in large lots and the demand remains settled. New purchasers were expected into the field as a result of the continued low prices and the uncertainty of coal production but this buying to date has been light.

REFINED MARKET BAROMETER

Continued strength in the kerosene market was about the only encouraging factor in the general refined oil market. The movement of all oils was slow, although few price changes developed. Refinery gasoline was generally sold at prices fractionally lower than last week, especially the lower endpoint products. Natural gasoline was in good demand and was particularly strong in California. Fuel oil and gas oil was freely offered, especially the low gravity and high cold test material. Much of this material was being offered out of Group 3 and Chicago for large orders at prices below the general market. Lubricants weakened in the Mid-Continent, neutrals being offered at a wide range of prices generally fractionally lower than those of last week. Bright stock was noticeably weaker both in the East and in the Mid-Continent. Wax continued to gain strength with prices slightly higher.

Mid-Continent—Lower prices prevailed in the general market for gasoline with the low end point material moving much slower than last week. Kerosene was in good demand at slightly higher prices. Natural gasoline production increased materially but was readily absorbed by the increased demand from refiners and the market was fairly strong. Fuel oil and gas oil moved slowly, the low gravity fuel oil and the high cold test gas oil finding but little demand. Lubricants were weaker with bright stock exceptionally weak.

Atlantic Seaboard—Gasoline and kerosene prices remained unchanged with movement only fair. Petrolatum prices were fractionally higher. Bright stock developed considerable weakness.

Pennsylvania—Gasoline and naphtha were weak and lower prices were posted for the low end point grades. Kerosene continued strong with fractional advances in price on the higher gravities. Bright stock was very weak and prices were materially lower than last week.

Chicago—There was little demand for practically all products, Kerosene being the only exception. High gravity fuels and low cold test gas oils were moving out at a fair rate but their volume did not support the general fuel oil market materially. The distillate movement was fair.

California—Natural gasoline was stronger while other refined products showed no tendency to advance in price. Fuel oil exports increased to stabilize that market but with these exceptions the general refined oil market was sluggish.

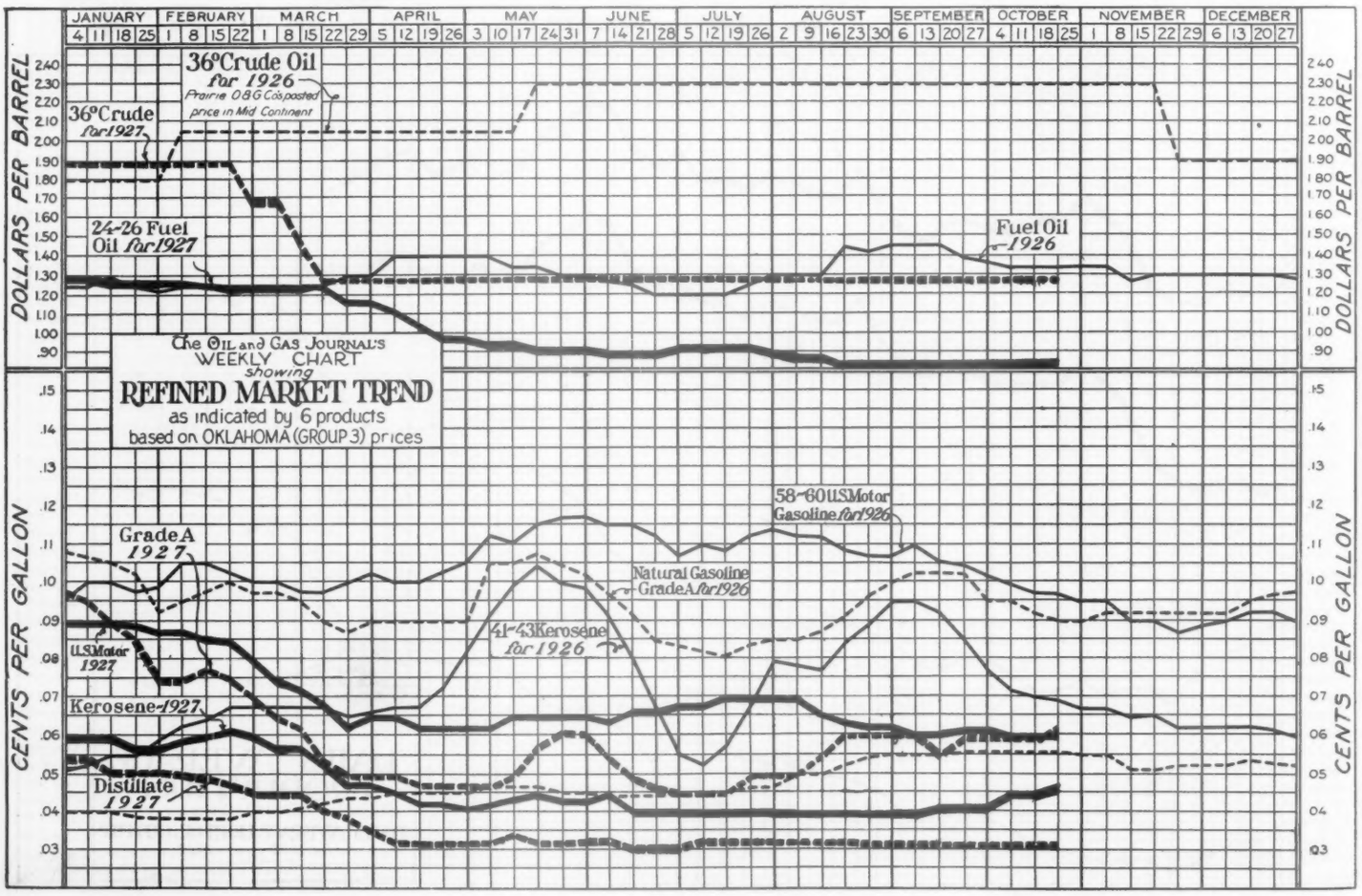
The competition being offered by the Chicago refiners on the lower gravity fuels has further limited the Oklahoma market in that district and, although there has been no general reduction in fuel prices some refiners have chosen to lower their price from 2½ cents to 5 cents a barrel to move substantial quantities of the material below 18 gravity. On the other hand, low cold test fuels are bringing from 5 to 10 cents above the general price and are in fair demand.

Lubricants did not move out very rapidly and were generally termed weak with small price concessions being made to hold up the volume. A wide range of prices existed as a result. Bright stock was relatively weak and could be purchased at prices fractionally under those of last week. The reduction reflects the lesser demand for motor oils. Wax continued strong as some refiners chose to run a portion of their production to storage in anticipation of still higher prices.

Natural Gasoline Strong

Natural gasolines were fairly strong as a result of the continued fair demand from the local refiners and, although natural gasoline production increased above the expected seasonal increase, all excess material was readily absorbed. One large buyer was obtaining quotations on 50-car lots and was expected to take several hundred cars immediately. Except for this inquiry there was little additional export business. The sale of natural gasoline motor fuels is increasing rather slowly but this can be expected. Additional tests are being made to perfect these fuels and to standardize them. Much interest is being shown among the jobbers in the possibility of increasing the benzol equivalent of their gasoline by the addition of natural gasoline. Some refiners are also blending natural gasoline in greater quantities than ordinarily with

(Continued on Page 174)



Engineers Consider Gas Utilization

Co-operative Agreements and Most Approved Practices to Obtain Maximum Oil Yield Discussed by Experts

By Thomas F. Smiley
Staff Correspondent

PONCA CITY, Okla., Oct. 18.—Natural gas is of paramount importance in the recovery and economical production of petroleum. The most efficient methods of utilizing it in this field, while known in great measure, are still a matter for study, experiment and co-operative investigation.

Principles underlying the best modern production practice may be embodied in agreements among operators in the same field, but specific rules in advance of actual development are impracticable and the operators probably would not subscribe to them.

These were among views on which substantial agreement was expressed at the meeting here Monday and Tuesday of this week of technicians, scientists and practical operators from throughout the United States who had been asked to study certain phases of production in the oil and gas industry.

Meeting Without Precedent

In point of frank, across-the-table discussion, the meeting was declared to be without precedent in petroleum history. "Never before," said William R. Boyd, Jr., of New York, assistant general secretary of the American Petroleum Institute, "did the expert technical men of major oil companies get together in this way and put the results of their research into a common pot not only for the benefit of the oil industry, but for the benefit of the public."

E. W. Clark, president of the American Petroleum Institute, was among the 84 petroleum engineers, geologists, chemists, and men in other branches of the oil industry who attended the sessions.

The closing day was taken up largely by discussion of the problem presented by the holder of a small lease in a pool where co-operative development is desired. It was pointed out that such a leaseholder often holds the key to the situation, since unanimity is imperative in co-operative development of a pool. One man who believed he could not profitably adopt the production program agreed to by the large operators might for this or some other reason refuse to enter the agreement and thus compel the other operators to pursue a course resulting in overproduction and needless drilling.

The One-Acre-Man Problem

In the course of the protracted discussion, such a leaseholder came to be referred to as "the one-acre man." The interchange of views centered largely about a suppositious case in which the one-acre man, without knowing what he might encounter, but believing his land favorably located on the structure, had to decide whether to drill and let his well flow wide open (if he got oil) or to enter the co-operative agreement on the theory that the best production practice would be likely to prove profitable on a small lease as well as on a large one.

There was little oneness of mind on this hypothetical case because of the almost numberless considerations entering into it, but the discussion elicited technical information of value.

The question, "if you had a one-acre lease between two wells owned by other men, would you drill or would you enter into a co-operative agreement?" was answered by one engineer, "I'd enter the agreement, because they would have two chances to beat me where I'd have only one chance to beat them."

Whether the one-acre man should be remunerated for his agreement not to drill was another phase of the question dealt with and various answers were given. The opinion was advanced that the large operators could afford to give such a man more than he could hope to make from operating his acre, and probably would be willing to give it, the question being how to persuade the man to join with the others in a program to prevent waste and extravagance if he should chance to be contentious.

Started Last December

The two day's meeting was the outcome of a resolution adopted by the American Petroleum Institute at its meeting in Tulsa last December naming a committee of seven to devise and suggest to the board of directors measures enabling the oil industry, while continuing to meet consumption requirements, to conserve in its natural state such reserves of petroleum as may not then be required for consumption. E. W. Marland, president of the Marland Oil Co., was made chairman of the committee.

Meeting in Colorado Springs last month, the committee of seven adopted a resolution creating a technical subcommittee, with Earl Oliver of Ponca City, as secretary, and four regional chairmen, as follows: G. C. Gester, chief geologist of the Standard Oil Co. of California, Pacfic Coast group; John R. Suman, director of production for the Humble Oil & Refining Co., Texas and Louisiana group; Fred E. Wood, chief production engineer for the Midwest Refining Co., Rocky Mountain group; and Dr. W. A. Haseman, research department, Marland Oil Co., Oklahoma and Kansas group.

Each regional chairman was directed to obtain as members of the subcommittee from his region such petroleum engineers and scientists as he might choose.

Each regional group then addressed itself to the study of these general problems: The importance of natural gas in the conservation and production of petroleum. the best means for utilization of gas in this way, and the comparative advantages in gas utilization, if any, of ideal co-operative development of an oil pool, as contrasted with the typical non-co-operative competitive drainage practice.

Mr. Marland presided at the sessions Monday and Tuesday of the subcommittee in the assembly room of the Marland office building in Ponca City.

General Discussion

Sessions Monday were devoted chiefly to the reports of the regional chairmen and to discussion of these reports and to interrogatories in which expert production engineers assumed the role of witnesses, with anybody in the room privileged to ask questions. This privilege was exercised freely. The reports of the regional committees were unanimous in the view that natural gas is the most important factor, at least in the early life of a well, in obtaining the maximum recovery of oil.

This prime importance is demonstrated, it was said, by the fact the comparison of production decline curves of wells shows a better sustained yield per well when gas is used. Efficient use of gas, it was asserted, results in a longer period of flowing life, more economical production, and in most cases smaller production of gas for each barrel of oil, thus preventing escape of gas for which there may be no market or use after it has left the well.

It was pointed out that the pressure of gas in an oil lowers its viscosity, thus causing more ready flow from the sand to the well.

Conservation of gas in an oil field may be accomplished, it was said, by segregating zones which are essentially gas zones from those which are predominantly oil zones by segregating gas and gas oil zones from barren zones; by affording adequate protection against water carrying sands; by efficient methods of production, that is production of the minimum amount of gas per barrel of oil or by the most efficient utilization of gas energy.

Practices Recommended

To achieve the most efficient use of gas, various producing practices were recommended, including correct size of tubing, correct depth for setting tubing (usually as near bottom as possible), application of back pressures, gas and air lift devices, suitable pumping equipment, correct spacing of wells and a systematic drilling program.

Shutting in of wells that produce unduly high gas-oil ratios in their relation to the field average was suggested as a conservation measure. Producing properties may be shut in, according to opinions expressed, without undue injury of wells or loss of ultimate recovery. In order that gas may be conserved in a gas oil field and its energy most effectively utilized in oil recovery the importance of uniform and thoroughly efficient drilling and producing practices was emphasized. Furthermore, in fields controlled by numerous land owners and lessors it was declared co-operation among the producing companies is necessary to accomplish the best results.

Repressuring is not economically feasible, it was asserted, without co-operation, excepting in cases where a whole structure or a very large area is held by the company operating it. The effect of back pressure can be nullified in part unless uniform practice is employed. Repressuring, it was said, does not restore original conditions and every effort should be made to utilize most efficiently the gas associated with the oil in its natural state.

Competitive Offsetting

Competitive offsetting of wells was declared to cause loss through the drilling of more wells than are needed to effect maximum recovery and to cause withdrawal of enormous quantities of flush production of oil and gas within short periods of time, resulting in overproduction and all its attendant evils.

A fact emphasized was that no one method of efficient recovery is equally applicable to all fields or to all wells in the same field or even to adjoining wells in the same lease. The same production methods may not be applicable to the same well in all stages of its productive life.

Conservation of gas in flowing or pumping wells characterized as a problem for individual study and experimentation for which no one rule or set of rules can be prepared.

Gas was declared to be most valuable in its natural state, as it cannot be replaced in its original form or by substitution.

As repressuring calls for compression, the gasoline in the gas is liquefied and the denuded gas is returned to the sand without the heavier fractions. The gasoline fractions greatly reduce the viscosity of the crude and therefore gas as applied in gas drives could not restore natural conditions.

Holds Back Water

The original gas pressure is important in holding back water encroachment, with the ever-present danger of oil being trapped and its recovery being prevented. Laboratory experiments were said to have shown that only a certain amount of gas can be dissolved in a given oil in bulk at a given pressure. It appears, however, that under conditions of intimate intermixture of oil and gas in the pore spaces of a sand a surplus of gas may be present

(Continued on Page 174)

INSTITUTE URGED TO NAME THREE FOR OIL CONSERVATION COMMITTEE

By Charles E. Kern
Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., Oct. 17.—The letter forwarded by Secretary Hubert Work, chairman of the Federal Oil Conservation Board, to President E. W. Clark of the American Petroleum Institute asking for the appointment of three recognized leaders conversant with and representative of all branches of the oil industry to confer with three representatives of the American Bar Association and three Government representatives to draft a tentative bill for study and consideration by the oil board to regulate the production of oil, is accepted here as an additional indication that the oil board earnestly desires the drafting of such a measure promptly so that it may be submitted to Congress.

It is no secret that Secretary Work has been disappointed in not having earlier heard from the mineral section of the American Bar Association which is to submit the names of three members of this committee. This delay by the mineral section has resulted from the care necessary in selecting the committee of nine of its members to look after this entire matter of legislation. As soon as that is done it is understood the committee selected will select three of its members for this important duty.

It is quite well believed here that the Federal Oil Board proposes to push this matter of oil legislation as rapidly as may be consistent with deliberation over the features of the oil bill.

It is not regarded as so important that this committee the appointment of which is being brought about by Secretary Work shall decide upon the exact language of the bill as that it shall indicate the needs of the industry, both from the point of view of the industry itself and of representatives of the Government, and indicate the essential legal features of the law that is to be drafted.

It is believed here that the oil board will feel that unnecessary delay in presenting this legislation will be equivalent to a neglect of the entire subject.

Mr. Work's Letter

"Representative leaders of the oil industry," said Secretary Work, in his letter to President Clark, "have from time to time during recent months made representations to this board that the overproduction of crude petroleum in this country was occasioning tremendous economic and financial losses and in consequence of this condition, this board has been petitioned for such relief as existing or prospective statutes might provide.

"In view of the present lack of authority on the part of the Federal Government through specific law to regulate the production of oil, and in view of the generally recognized menace through overproduction to the country's national petroleum resources, it was my privilege at a recent meeting of the Minerals Section of the American Bar Association to suggest, in conformity with the expressed desire of the industry and also in accordance with the belief entertained by this board that needless and extravagant production of oil should now and in the future be avoided, that a committee of nine be selected to draft a tentative bill which might properly and equitably meet the situation."

Has the Turning Point Been Reached?

Rapid Decline in Greater Seminole Area Causing Discussion of Where Next Field Will Be Found

By E. B. Reeser
President, Barnsdall Corporation

The rapid decline in the total production from the Greater Seminole area is causing many questions to be asked. The principal topic of conversation at the clubs and at many social gatherings among the oil fraternity is, "Where will the next field be found?"

The writer has been engaged in various activities of the industry since 1891. He has seen the producing areas spread from the banks of the Allegheny through the Central West into the Mid-Continent and California. He has seen the daily production in the United States climb from 10,000 barrels per day to more than 2,500,000 barrels daily. A recent

E. B. Reeser

visit with several "old timers" brought up many recollections in connection with the marvelous expansion of the industry.

"Where do we go from here?" has been the question that followed the defining of the producing area of each new field. "Texas" has been the magic word for several years and with the vast territory yet to be explored in that great empire it will undoubtedly be the next move for many others. A study of the map of Texas, however, reveals the fact that the development from the Red River on the north has spread across the state with great rapidity. New pools or fields have followed on the heels of each other until the banks of the Rio Grande have been reached. From the Gulf of Mexico on the southeast to the Panhandle in the far away northwestern part of the state great areas have been developed.

Difficult to Maintain Production

Kansas, Oklahoma, and Texas have for many years been regarded as "backbone" of the oil industry. The volume of petroleum recovered from this area during the past 25 years is so great that it is difficult to comprehend it. On account of the high cost of drilling in the deeper producing sands the efforts of the great army of small operators have been directed chiefly to the shallow territory of Kansas and Oklahoma. Every probable "spot" has apparently been tested and this territory must be considered in the same class as the eastern fields—it will be difficult to maintain the present production.

New fields will undoubtedly be found in the deep sands of central and western Oklahoma but there never was such a field as Seminole until it was discovered a little more than a year ago and it would not be considered good business judgment to depend on or anticipate another one of such magnitude being found within the next few years.

Texas? Yes, many new fields will be found but they will not be of the good old-fashioned "sand" formation and the oil will not be of the kind that refiners really desire and because of the geological formations they will as a rule not have the staying qualities of the fields an "old timer" is prone to think about. It must also be remembered that in searching for the fields already found vast areas have been eliminated from the probable oil producing territory.

California is really the one area that seems to justify the statement that because of its tremendous sand thickness approximately the present production will be maintained for several years.

Rocky Mountain Area Tested

Every student of the petroleum industry will admit that it will not be easy to maintain a daily production of 2,500,000 barrels. True, many point to the great Rocky Mountain States as a territory from which we can draw our requirements for many years to come. The oil industry with its $11,000,000,000 of investment should begin to use business judgment on which to conserve its present supplies and on which to build a foundation for the future. Have experiences of the past few years in the Rocky Mountain States been such as to justify a reliance on them for our future needs? Development work in Montana, Wyoming, Colorado and New Mexico has been going on in a very diligent manner for several years. We find that in 1924 the four states just named produced 42,510,000 barrels, while in 1926 they produced 37,682,000 barrels. A number of new fields or pools have been reported in these states during the period referred to but outside of the great Salt Creek Field in Wyoming the production of the four states has increased only about 25,000 barrels per day. Geology has been worked to the last degree in these areas. A number of the most efficient and best-qualified companies in the United States have exerted their best efforts. It is fair to assume that each wildcat well drilled has been located on the best possible structure their trained geologists could find. The net result of approximately 25,000 barrels per day is certainly not a result on which to build the future but on the contrary should be considered indicative of what may be expected.

The proportion of dry holes in the Rocky Mountain States to which the industry has pointed as our future reserve is very impressive. In Wyoming, for instance, outside of the Salt Creek Field,

(Continued on Page 174)

America's Policy on Exports of Oil

Webb Export Act Corporation for Regulation of Business Abroad Would Accomplish Much Good

By Special Correspondent

Oil exports enjoy a unique position in the national economy of the United States.

American exports of petroleum and its products increased from $472,951,855 in 1925 to $554,194,651 in 1926. For the first eight months of 1927 these same oil exports are valued at $335,868,282 as against $372,487,740 for the same period of 1926. Expressed in terms of value these figures do not show the true quantitative changes since in general export prices have decreased constantly during the past two years while the volume has steadily increased.

For many years petroleum exports have ranked consistently second of all exports, immediately following raw cotton while refined oils head the list of all exports of manufactured products.

Petroleum Exports Different

In all export of manufactured or agricultural products it is generally assumed that the quantity exported represents a surplus of domestic production over and above domestic consumption. Our exportable surplus of these manufactured or processed goods, when added to the quantities manufactured or grown for domestic use give a constantly expanding mass production with its resulting lowered per unit cost of production and economies shared by both foreign and domestic consumer. In few cases in the United States are manufacturing or agricultural productive facilities designed exclusively for the specific requirements of foreign trade as is the case in the older industrial countries of Europe such as England and Germany.

This economic philosophy applies to fabricated and replaceable articles whose production is possible by widely distributed and practically limitless quantities of raw materials, in many cases easily replaced by substitutes and few, if any, of which might be termed as vital to the national defense, merchant marine or social welfare of the entire nation.

We submit that the export of petroleum products stands in an entirely different category and as such should proceed on a basis radically different from that applied to other merchandise.

Irrespective of immediate or far distant exhaustion of our petroleum resources and despite temporary overproduction in scattered areas, there seems to be no logical reason for so stimulating the foreign demand for oil as to create a continuously enlarging drain of such vital national American resource as petroleum.

American Crude Cheap Now

American crude oil is now so cheap as to make it profitable to export it to petroleum producing countries such as Mexico and Borneo for blending with the lowest quality crude oils for refining. Oil products originating in California are brought through the Panama Canal to the East Coast of the United States, then across the Atlantic Ocean to Europe and still compete with Russian, Persian, Rumanian and Polish oils almost immediately at hand.

Russian oil in Europe is regarded by the Soviets as a political commodity, not a commercial product, and is sold on a noncommercial basis. This oil is marketed in constantly increasing quantities and represents an important factor in this market which absorbs probably 65 per cent of all United States petroleum exports. American oil, a strictly commercial product, is thus sold in open competition with the political product, Russian oil.

Webb Export Trade Act

Excessive competition among the smaller American refiners in the dumping of distress stocks, forced by periodic overproduction, on the export market has a constantly depressing effect on export prices, which in turn reacts unfavorably on domestic markets and thus proves a boomerang. Many of these refiners frankly admit that their position would be greatly improved without export markets provided, of course, that some unabrupt and equitable means be found to achieve this end.

The legal basis for this achievement exists in the Webb Export Trade Act.

Many other industries, facing problems similar to that of the present day petroleum industry, such as cement, zinc, copper, lumber, phosphates and others have taken advantage of this law to stabilize their export trade.

Abroad, the European Steel Combination, Dye Trust, the German Cartell System, English con-

(Continued on Page 174)

Survey of Petroleum Situation Abroad

Russian Oil Exports Establish High Record. Venezuela Has 313,000 Bbls. Daily Shut In. Less Gasoline to France

By Special Correspondent

Russian oil is still the outstanding topic of interest to the oil industry in Europe. During August, 1927, the three largest Russian oil trusts produced 856,900 metric tons of oil, distributed as follows:

	Metric Tons	Program of Requirements %
Azneft	573,900	96.2
Grozneft	259,900	100.9
Embaneft	23,700	102.6
Total	856,900	97.6

During August, 33,767 meters were drilled, that is, 5 per cent more than scheduled. Azneft fulfilled 95.9 per cent of the scheduled drillings; Grozneft, 107.3 per cent; and Embaneft, 87.4 per cent.

During the 11 months of the current fiscal year, from October, 1926, to August 31, 1927, the gross production of gas and oil by these three trusts amounted to 9,400,000 tons; this in excess of the program by 1 per cent. The schedule for drillings is not fulfilled by 7.9 per cent—the total number drilled was 364,487 meters; Embaneft fell short by 10.7 per cent, Azneft by 10.1 per cent, while Grozneft exceeded the schedule by 1.9 per cent.

During these 11 months the distilling and refining plants treated 6,017,000 tons of oil, which is short of the schedule by 1.4 per cent.

New Export Record

During July, the latest figures available, the exports of Russian oil established a new record of 191,200 tons as against 148,000 tons during July of 1926, and 176,100 tons during the preceding month. Among the important increases are noted the following exports:

	1927	1926
Gasoline	72,700	40,100
Crude oil	23,700	12,200

During the 10 months from October, 1926, to July 31, 1927, the total exports of oil products amounted to 1,609,800 tons as against 1,135,400 tons during the corresponding period of last year, that is an increase by 41.8 per cent. Exports of kerosene increased by 70 per cent, gasoline by 43.4 per cent, lubricating oils 39.3 per cent, oil fuel 37.6 per cent and crude oil 24.6 per cent.

Anti-British Campaign

In an anti-British campaign started by the Third International in Persia the chief point of attack is the oil industry and particularly the Anglo-Persian Oil Company. A barrage of special propaganda is accompanying discussions for a new Soviet-Persian trade treaty. A sample of this propaganda appealing to the Persian people is quoted below:

"As long as the activities of the Anglo-Persian—the commanders of British Imperialism in Persia—are unrestricted, so long will the industry of the country be abnormal and it will be impossible for the Persian government to carry on an independent existence and to carry out independent policies, etc."

The campaign in Persia itself is concentrating on the oil industry in which the nationalization of the fields is emphasized.

During the nine months, October 1, 1926, to June 30, 1927, Russian authorities announce the following quantities of oil products sold for domestic consumption:

	9 months 1925-26 (metric tons)	9 months 1926-27 (metric tons)
Dark lubricating oil	95,193	116,004
Gasoline	43,355	54,085
Light lubricating oil	40,587	43,066
Axle oil	8,409	8,254
Other oil products	59,843	64,667

The chief inspector, appointed by the Supreme Economic Soviet, has investigated the position of the oil industry and reported to the Soviet on the state of investments for the last four years. According to this authority the Russian Soviet have invested in the industry a total of 503,000,000 roubles, of which 474,000,000 have been expended on new constructions and on the extension and revival of old undertakings. Azneft received from the State the sum of 303,000,000 roubles. The remaining 200,000,000, at the rate of 50,000,000 a year, have been invested in all the remaining Russian oil fields.

Special Foreign Service

Realizing the great importance of petroleum development abroad to the oil industry of the United States, The Oil and Gas Journal has completed arrangements for a special survey of conditions in the principal oil producing and consuming foreign countries, to be presented once a month. The accompanying article is the first of this special service.

Production in other countries has practically as much effect upon the situation in the United States as does the development of new fields in this country for this foreign crude either finds its way into the United States or takes the place of American crude which otherwise would be required. Consequently, the petroleum industry of the United States is vitally interested in what is going on in other countries. It was to supply the latest available information that The Oil and Gas Journal arranged for this monthly special foreign service.

Great Britain

Oil imports into Great Britain for the four weeks ended September 5, are as follows:

Product—	Imperial Gals.	From U. S.	% from U.S.	Balance from
Lubricating oil	8,429,884	7,633,180	90	Russia and C. P.
Crude oil	39,520,514	.....	..	Persia, Mexico, Curacao
Fuel oil	32,973,831	11,243,837	34	Trinidad, Curacao and Mexico
Gasoline	42,532,335	31,094,977	73	Russia, Rumania, D.E.I.
Kerosene	25,052,861	14,223,575	57	Russia, Mexico, Rumania & C. P.
Gas oil	9,057,990	6,336,881	70	Mexico, Russia, & Trinidad
Other	13,812	8,094	60	Continental ports
	157,581,227	70,540,544	45	

As from September 1, the prices of fuel oil and Diesel oil in British ports have been reduced by 5 shillings per ton. This reduction still leaves the price too high, according to many authorities in comparison with the present low prices now prevailing for British bunker coal.

The anti-Russian oil campaign seems to have been ineffective in that sales of Russian oil are progressing on a larger scale than ever. During the first six months of 1927, according to preliminary statistics, a total of 31,430,000 Imperial gallons of gasoline were imported into Great Britain from Russia as compared with 28,670,000 gallons during the same period last year. Great Britain's total imports of gasoline from all sources for the first eight months of this year amounted to 378,000,000 Imperial gallons as compared with about 382,000,000 gallons for the same period of 1926. Figures on the gasoline output of domestic refineries are not yet available.

There were 4,300,000 gallons of Russian lubricating oil imported in the first eight months of 1927, as compared with less than 1,000,000 gallons in the same period of 1926. Russian gas oil imports for the same period respectively were 4,200,000 gallons for 1927 and 1,500,000 gallons for 1926.

An interesting analysis of the petroleum requirements of the British Empire has just appeared. According to the analysis, at the present time importations into the British Dominions amount to about 10,000,000 tons annually of petroleum, or its derivatives. Of these, nearly half is designated as crude oil, and of this crude about 4,650,000 tons goes to Great Britain and Canada, the remainder being absorbed by Australia, New Zealand, Egypt, Ceylon, Cyprus, St. Vincent, British Guiana and Newfoundland. Canada and Great Britain divide this imported crude about equally, but from the viewpoint of refining facilities, Canada's quota of 2,328,667 tons per year must be increased by its own production of 45,465 tons, less its exports of 27,147 tons. From the figures on the empire's refining capacity of 170,000 barrels of crude per day, it is noted that this is only the equivalent of the output of four large refineries in the United States.

Venezuela

In Venezuela, the average monthly production for the year 1927, has been 4,517,367 barrels with a total for the first six months of 27,104,203 barrels. According to the latest advice, Venezuelan production will surpass that of Mexico before the end of 1927 and take third rank in the world's production.

Reliable estimates place the present potential production of Venezuela at 495,000 barrels per day. Production to the amount of 313,300 barrels per day is shut in, according to the same estimate, due to lack of storage and shipping facilities. Estimates as of the middle of August show that 9,522,500 barrels of oil in storage which was the limit of storage capacity at that date. To date there have been approximately 800 wells drilled in Venezuela, of which 685 were producers, 115 dry. On August 1, there were 47 wells being drilled, 11 rigged up and 32 derricks built ready for the setting of the drilling machinery. There are now being drilled in Venezuela 23 wildcat wells by nine different companies. Recently four new American companies have entered the field to develop in unproven area.

France

French statistics for the first seven months of 1927 show that 1,219,952 metric tons of petroleum products were imported into France during that period as compared with 1,280,677 metric tons during the same period of 1926, this showing a decrease of 60,725 metric tons.

The decrease in kerosene is easily understood due to the rapid electrification of the country districts. The decrease in gasoline of 12.376 tons is difficult to explain in the face of the rapid development of the automotive industry, and would tend to support the recent idea that Europe is approaching the peak of gasoline consumption.

Although imports from the United States represent almost 60 per cent of the total French imports for the first seven months of 1927, the percentage in 1926 was 66 per cent and the present decrease has been noted in practically all products.

Larger quantities of oil have been imported into France from Russia and Rumania but the important increase appears in imports from Persia and the Dutch East Indies.

Spain

Advices from Spain indicate that the concession for the operation of the State Petroleum Monopoly will probably be awarded to the Banking Consortium led by Don Idelfonso Fierro, present owner of a controlling interest in the match monopoly, and supported by some 27 of the leading banks of Spain. This group would assume among other obligations that of satisfying at least 80 per cent of Spanish consumption of refined products within a five-year period by the extensive development of a domestic

(Continued on Page 174)

The Oil Problem; Causes and Remedies

Regulation by Commission Unworkable. Government Should Experiment on Extraction of Oils From Shales

By F. C. Proctor

Old-timers in the oil industry have told me that ever since Colonel Drake in 1859 drilled the first oil well (69 feet deep) there have been recurrent alarms that our petroleum resources would soon be exhausted. Certainly there have been these during the 20-odd years that I have been connected with this industry. Particularly do I recall, in about 1914, an impassioned prophecy from a very strong character, that all of the oil would be gone in 10 years. This and many other like prophecies are somewhat overdue. Recently this alarm on the part of the public has recurred in an acute form, following the report of the Federal Oil Conservation Board and many newspaper suggestions what to do about this matter. With these latter I am not in accord. Answer to this question should be controlled by reason, not by the hysteria of the public, nor by the self interest of the oil companies.

It would be unfair for the reader to assume that one who has been connected with the oil industry is so prejudiced in opinion that he cannot consider this problem dispassionately, and therefore is not entitled to a hearing. To the contrary, his interest in the industry should make him see that, if there be any need to conserve our petroleum, this is far more important to the industry than it is to the public. For if the petroleum should be exhausted, the public would still get its oils from the shales, coal and lignite, probably at a somewhat higher, but not unreasonable, price but a large part of the investments of the industry—appraised at from $9,000,000,000 to $11,000,000,000—would be of little value. The problem is of great concern to the public, but of greater concern to the industry.

Laws as General Cureall

At this time, when the public's fear is greatest that it will soon lack for oil, the industry is staggering under the burden of taking care of too much oil, and fears there is more to come. Yet I think it is not strange that from these wholly contradictory fears by the public that there will be too little oil, by the industry that there will be too much, there should arise an agitation for control of oil production by law. For this is the Great American fetish—this belief that government through laws can afford relief for every ill, economic or moral. Our history is replete with proofs that restraint by law, once begun, always increases. For example, prohibition, the careers of the Interstate Commerce Commission, and of all other public boards and utility commissions. This is logical in the worshipers of this fetish. Failing to recognize that legal restraints only muddle up temporarily, but never control permanently, the workings of economic laws, they reason that the failure to accomplish their purpose is because the dose was too mild, and demand that it be administered more and more drastically.

All will agree that the conditions in the different oil fields are so dissimilar that there could not be prescribed by statute the prohibitions that would restrict production of oil, so that by mere obedience to the statute that result would follow. This could be accomplished, if at all, only by vesting in some commission, or other tribunal, broad powers to control the drilling and operating of wells, as in its judgment conditions may require to secure that result.

I shall not discuss the many objections to government by commissions or bureaus; they are known to all intelligent men. I content myself with presenting two objections that are peculiar to this problem: the one convincing me that any scheme of restraint of production of oil by law is wholly unworkable under our system of government; the other that, if workable, the result attained would be no protection to the public, if there be any danger that our petroleum resources will soon be exhausted.

A Few of the "High Spots"

The accompanying article by Mr. Proctor deserves the careful attention of everyone connected with the petroleum industry and all those who may feel that some sort of regulation is desirable. A few of the pertinent statements made by Mr. Proctor include the following:

Control of production of oil through commissions is unworkable under our system of government.

Conservation of our petroleum resources is not an adequate remedy to protect the public, if there be any danger that these resources will be exhausted in a few years.

To protect the public against a lack of oils the Government should demonstrate, by experimentation, that they can be extracted, at a reasonable cost, from shales, coal and lignite.

Politicians have made it almost impossible for the industry to do anything to protect itself or the public.

We shall never lack for petroleum.

The industry should make no effort to restrict by law supply to equal demand but should use the means, sound in economics, to secure the result of increasing the demand to equal the supply. This would be through enlarging the uses of oil.

Control of production of oil through commissions is unworkable under our system of government.

An initial obstacle is that there cannot be any one commission to control the production of oil in all the states in which it is produced. Congress cannot create any Federal commission to do so. This is because of the careful limtations in the Constitution upon the powers of the Federal Government. The drilling and operating of oil wells, within Oklahoma, is an intrastate activity, subject to the control of that state alone, and wholly without the scope of any power of the Federal Government. I feel safe in saying that there has never been any opinion of any court that can be cited to support the existence of that power in the Federal Government. I have heard it claimed that there is an intimation to that effect in the dissenting opinions in the first child-labor case. This is erroneous. In that case Congress had attempted to prohibit the transportation in interstate commerce of an article manufactured by child labor. Every Justice on the Supreme Court recognized that the question whether child labor should be employed in manufacture within a state was one to be determined by the state alone, and that Congress could not forbid it. They also recognized that the power of Congress to regulate interstate commerce was supreme. The question decided was whether Congress could exercise its acknowledged power over interstate commerce, to accomplish indirectly that which it could not do directly—prevent the employment of child labor. The majority held it could not. The bar generally has approved its decision. It has always seemed to me to be sound, for a contrary rule would permit Congress, through indirection, to usurp completely the powers of the state, to create one central government, and to convert the states into mere provinces thereof—in brief, to destroy local government. There is no warrant to believe that this opinion will be reversed; the record of the Court will show that majority opinions are just as much adhered to as are those in which all of the justices concurred. But, if Congress could be induced to create a Federal board with power to curb production, the trial courts would be compelled to follow the majority opinion in the case referred to; it would be several years before the Supreme Court would have the opportunity to reverse that holding and sustain the validity of such board. Pending this delay, the problem would disappear, or be solved otherwise.

Common Defense and Welfare

Further, Congress cannot create a commission to control the production of oil upon the theory of providing "for the common defense and general welfare." The Constitution does not give to Congress power to enact any law that its wisdom approves, for these purposes; the power is simply to lay and collect taxes to these ends. Probably no principle is better settled than that Congress cannot exercise powers that the states never granted to the Federal Government and definitely reserved to themselves; it is the very foundation upon which the structure of our government is erected.

I think all of us would agree that, if there should ever be a need for control by government of oil production, it is unfortunate that this control cannot be by the Federal Government; certainly it would be more uniform, more efficient, and fairer than control by the states. But we have to take our government as it is, deficient though it may be. In the solution of our oil problem we cannot expect a change to be made in the fundamental principle upon which our system of government is founded—the careful balancing of powers between the Federal Government and the states, leaving to the latter complete control over their internal affairs.

But I can omit further discussion of this phase; it has been completely covered recently in the very able address by Judge James A. Veasey before the American Bar Association. I think no lawyer who reads this address will thereafter contend that there is any power whatever in Congress, either directly or through a commission, to control production of oil in the states; except, of course, upon the public lands and those of the Indians, wards of our nation.

Cannot Create One Commission

There is no means under our system of government to procure the creation, by the group of states in which oil is produced, of one commission with power to restrict production in all of them. This lack of ability to compel uniform action with respect to a subject of interest to several states has been keenly felt in regard to water supplies. But under the constitutions of the United States and of the several states each of the latter is a separate and wholly independent sovereignty. I feel quite sure that it would require an amendment to the constitution of each of the interested states to permit its Legislature to confer the power to control production of oil in that state upon a commission, at times sitting without that state, and composed in part of citizens of other states.

Therefore, the sole power to put into effect any scheme to restrain production by law is in the state, and exercisable solely with respect to the production of that state. Oil is produced in 20 states; it would take many years to procure the passage of laws, creating commissions to regulate production of oil, in all of them. But let us assume that this would only be necessary in the states of large production. This would require commissions with such powers in Oklahoma, Texas, California, Louisiana and Arkansas. None of these could be omitted from the scheme with any safety, for in each of them there has been, in the past few years, some one or more fields whose production made an excess in supply over demand in the entire country; surely it should be anticipated that these instances will again occur. Even this would not give certain protection against a recurrence of overproduction, if large deposits should be found elsewhere—for example, in Missouri, where I understand the geological conditions are favorable. But I do not believe the requisite legislation could be procured in the five states mentioned. Endeavors to procure this would have to be made by the oil companies; no one else could be made sufficiently interested. No matter how camouflaged, as designed to conserve gas, it would be plain that the proposed measures were to restrict production of oil. Any legislator would know that this would increase the price of gasoline. The average legislator would think that the measures were intended to help the big oil companies at the expense of his constituents. Further, it is my experience that legislatures are not much interested in proposals for the benefit of all of the people of our nation; they are concerned chiefly in the welfare of the citizens of their own state. Assuming that you could convince the Legislature of California, for example, that restriction of production is essential for all the people, including Californians, would it not delay to act until Texas and Oklahoma should adopt measures to that end? Would not such legislative delays result from fear that its own people might be put at a disadvantage by failure of the other states to conserve oil? I think my pessimism is not unwarranted when we recall the failures, for over 20 years, to procure uniform laws of divorce and of negotiable paper. There was no dispute of the necessity for these measures, nor suspicion of the purposes of their proponents.

Jobs for Politicians

But if such commissions were created they would not operate fairly or efficiently. The insecurity of the tenure of office and inadequate salaries would keep qualified men off and put politicians on such commissions. It has been my experience of over 30 years that these politicians, not always but usually, are influenced in deciding the problems presented, not by consideration of them, but by bias or prejudice or the purpose to gain votes. Before condemning this statement as intemperate, I request that the reader will recall carefully all of his experience with these state boards.

These several state commissions would act entirely independently of each other. There might be an occasional junketing trip to each other's jurisdiction, but no real opportunity to consult and determine upon some fair and harmonious plan to

accomplish the purpose of their creation. There would be the usual jealousies and lack of faith in the good intentions of the other commissions. Each commission would believe that the others were permitting their citizens to extract too much oil, and that the citizens of its own state were thereby suffering. In each state there would be many citizens and many oil people to pour such tales into the willing ears of the commissioners. The latter would adopt sharp practices to favor their own citizens—would be induced to modify their regulations in return for specious promises of large development, construction of pipe lines, establishment of refineries, etc.

Of one phase at least of this problem, I am quite certain. That is that its solution will not be found in the conferring of powers upon state commissions to restrict production. This would only further muddle up the problem, and render more difficult an already very difficult situation.

Conservation of our petroleum resources is not an adequate remedy to protect the public, if there be any danger that these resources will be exhausted in a few years.

Let us make several assumptions that I think the reader will consider quite violent: That all of the oil-producing states, or the five of largest production, shall have passed laws providing for commissions to conserve the oil; that these laws are wise and have performed the seemingly impossible task of giving to the commissions the essential absolute control over production, and yet left ample room for exercise of initiative and ingenuity by the operator—also essentials in this business; that they have not frightened capital, although they may regulate or prohibit its expenditure; that the commissioners are all men of fine character and ability, thoroughly conversant with the oil business, its requirements, and the needs of the public, and are wise and fair in all their rulings; that the commissions of all the states have consulted and agreed upon, and are carrying out in good faith, a uniform and wise plan to conserve the oil. What would be the effect of a perfect conservation of our petroleum resources? The result would be utterly inadequate to protect the public, if the exhaustion of our petroleum resources is to come soon.

"Soon," in this connection, certainly means within a few years. Suppose we take six years as the period in which oil would be exhausted under present practices. I take this because it comports somewhat with the conclusions (stated to be theoretical and to cover only known deposits) of the Federal Oil Conservation Board; though not exactly, because when its conclusions were made evidently there were not taken into consideration the oil deposits later discovered in the Seminole area and in West Texas, or the increasing consumption following such discoveries.

I do not know how much of the oil the conservationists expect the industry to conserve, but I suggest 25 per cent; surely this is liberal.

Therefore, if under present practices the petroleum would play out in six years and under perfect conservation the industry could supply the needs of the public with 75 per cent of the quantity it now consumes, the only effect would be that the petroleum would not be exhausted for eight years. Of course this is a speculation. Based as it is upon an estimate that, with all due respect, from the very nature of the problem, could only have been a guess, it cannot be anything else. But the point is that if the exhaustion of petroleum is to come soon—and that is the sole basis for suggestion that government should control its production—you may take any limited number of years as the duration under present practices of these supplies, and give effect to any possible saving that may be accomplished under perfect conservation, and all that you will have accomplished is to add a further very brief period before the public will lack for oil.

If our general industries will soon be unable to get their refined oils, is the material point to them whether that deprivation shall come in five years or in six years? If the public will soon be unable to get its gasoline, is the important question to it whether that inability shall come in six years or in eight years? If our nation is soon to be imperilled for lack of gasoline, is the important point to it to consider how to prolong the time in which its safety will continue from 8 to 10 or 11 years

To protect the public against a lack of oils the Government should demonstrate, by experimentation, that they can be extracted, at a reasonable cost, from the shales, coal and lignite.

I think all of us should cease efforts for restraint by law of production of oil, or its control or regulation by commission or other governmental agency. This is no solution of the problem. Respectfully I suggest that those in high office, responsible for the safety of the nation, should cease to endeavor to assure such security for trivial additional periods. The important point in the interest of the nation and of the public is to provide, not for a short time, but for an indefinite time—practically for all time—against a lack of essential oils.

I understand there is no doubt that these oils can be secured from the shales, coal and lignite, fortunately in abundance. In this regard those best posted seem to be positive, as also that this can be done at a reasonable cost. Of course, I do not know—probably no one knows—the exact cost. I judge there is no warrant to believe that the oils can be extracted from these substitutes as cheaply as from petroleum. A fair surmise is that the public would have to pay a higher price, but that the price that it would pay, for example, for gasoline made from these substitutes, would represent no larger increase over the 1913 price than the average commodity used by the public has had.

This experimentation should be made at once and of course by the Government. The public would be far better satisfied with the results obtained by its own agents than by any one else. There should be selected for this experiment that substitute for petroleum that its technologists deem the most promising. This experimentation should be of sufficient size and duration to demonstrate its success, the feasibility of procuring the substitute from which the oil is made—vast areas of which the Government now owns—and the costs of such extraction. The oils obtained should be submitted to every theoretical and practical test to determine that they can be used for all the purposes for which refined oils are now used. If the test of the substitute selected shall not be satisfactory, make the same practical experiment with the other substitutes until it shall be conclusively demonstrated that there will be no lack of oils, even if petroleum should be exhausted.

This would involve a considerable expense. I do not know how much, but it would be moderate and clearly warranted by the importance of this problem, in view of the great benefit to the people and to the various industries using oils, if there could be laid at rest for all time the anxiety that they may lack for oils. More important than this, we would know — from actual demonstration — exactly what we are doing. If this demonstration should be successful, as the leaders of the oil industry are confident would be the case, that industry could go on as other industries, unfettered by any governmental control. If it should be unsuccessful, we would know what we are doing, and could proceed by amendment to the Constitution of the United States, or otherwise, to protect ourselves, as best we can, against a lack of oils.

Conservation

The positions I have taken in the foregoing are: First, that under our system of dual governments the only possible control by government over the production of oil is through state commissions; that such plan of control is unworkable, and will not effect any conservation. Second, that, if the exhaustion of petroleum is to come within a few years, the most perfect plan of conservation conceivable would only add to the short duration of our oil supplies a further briefer period; that this would be utterly inadequate as a remedy—indeed, no remedy at all—to protect the interests of the public, which are to get its neded oils for a long future period. And, third, that assurance of this can be secured through demonstration by the Government that, if all of the petroleum should be exhausted, the public could get its oils from shales, coal and lignite, at reasonable prices.

However, if it should be conceded that our oil resources will not play out soon—that is, that they will last for a considerable time, say, 50 years, no one would contend that it was not worth an earnest effort to add 10 or 15 years to their duration. This concession would be a complete answer to my second objection above. Likewise, it would be a complete answer to this agitation for governmental control over the production of oil, for it would satisfy all reasonable citizens that there is no emergency demanding this control. They would be content, for some time, to let the oil industry work out this problem.

This concession would not satisfy my first objection above. I would still be of the opinion that no effectual conservation could be secured through control by state commissions, and this is all that this agitation could lead to. But this question, for the present, would be moot. It would not become one demanding answer until after the industry should have shown its inability to solve this problem, and the public should have determined it necessary to intervene in protection of its own interests.

Cracking Processes

But I am unwilling that the reader may get an erroneous impression that I am opposed to conservation of our oil resources. As stated, I think the only absolute protection to the public against a danger of lack of oils is for the Government to demonstrate that they can be gotten from the shales, coal, or lignite; but unless and until this be done, of course it is necessary to guard against that danger, as best we can, by conserving our petroleum resources as far as is practical. To my mind conservation does not imply nonuse, but use of the natural resource to the extent necessary to supply the needs of the public. That amount necessary to supply these needs is to be determined, not by the minimum that the utmost endeavor would require, but by the amount necessary to be used practically to supply them. I illustrate this by considering the principal charge of waste against the industry. This is the consumption as fuel of any products from which gasoline can be extracted. The art of refining has so progressed that, through repeated use of the cracking process, nearly the whole barrel of crude can be converted into gasoline. But this repeated use is very expensive, and there comes a period in these operations when it costs more to extract further gasoline than the latter would sell for. The refinery cannot go on extracting gasoline at a loss, for this would make it impossible for it to continue in business. It can not store the residuum indefinitely—the idle capital in this residuum and its containers making this impossible—consequently it sells the residuum as fuel oil. This is the only way that the business can be conducted. The refinery should not be expected, at a loss, to extract all of the gasoline possible in order to lessen the amount of crude it consumes. To demand this is not to demand conservation; it is to demand an impossibility.

The art of extracting all of the gasoline from the crude has been developed in the last few years in a very high degree; for the present probably nothing more in that way can be done. Possibly the costs of its extraction may be later reduced; I have no doubt that every refinery is trying to accomplish this. The importance of this upon the problem of the possibility of the exhaustion of our petroleum resources is that the ability to extract further gasoline more cheaply would lead to the consumption of less crude by our refineries, and I think here lies the hope in this regard for conservation of our oil resources. This would be practical conservation, resulting simply from the operation of economic law.

There are other suggestions urged as measures of conservation. One might be called the oil-gas ratio plan of producing oil. In its briefest terms it would prohibit the escape of gas from an oil well and compel the reutilization of the gas as a means of extracting oil. Another is the unit plan of operation that contemplates fewer wells to get the oil from a given area, and greater conservation of the gas as the agent to raise the oil. For both the essential claim is that the industry would get more oil. To these plans there occur to me two objections that I think are worthy of consideration:

Water and Gas Drive

The first is that, while it is obviously to the advantage of the industry to get more oil at the same cost, or the same amount of oil at a less cost, are these measures to conserve it? Under present practices only about 20 per cent of the oil is produced, the balance remaining in the ground. Many in this industry, looking far into the future, have considered this balance as a reserve that could be drawn upon if there should be any necessity to secure it. While not fully proven,

(Continued on Page 169)

Leaders Requested Analysis

Houston, Tex., October 15, 1927.

E. W. Clark,
President, American Petroleum Institute.
250 Park Avenue, New York City, New York.
Dear Mr. Clark:

For many years I was general counsel of one of the larger oil concerns. Although I retired from this work several years ago, my interest in the oil industry has not abated. I have endeavored to follow its fortunes and to understand its problems.

At different times recently I have been requested by a number of my friends in the industry to attempt an analysis of the difficult situation that now confronts it, to suggest a course to be pursued, and to make these public. Among the gentlemen making such requests were Mr. Teagle, W. L. Mellon, Mr. Beaty, Mr. Davidson, Mr. Farish and Mr. Leovy. Although I feared they paid me too generous a compliment, yet I felt I should comply with their requests, and have written the attached paper.

I have submitted to these gentlemen the thoughts of this paper, though not in the exact form in which they are presented. I understand they all concur in the main in all that I have said.

It seems to me the fitting way to give publicity to this paper is to send it to you as president of the association that is representative of the entire industry, and then to mail it to members of the latter, and to some others, who may be interested.

With assurances of my esteem, I am

Sincerely yours,
F. C. PROCTOR.

Principles of Air-Gas Lift Practice

Methods as Applied to Oil Production Are Explained and Sources of Error in Data Being Collected Discussed

By H. R. Pierce and James O. Lewis*

Since the sudden revival of the air or gas-lift and its extensive use in the oil fields, many questions have arisen as to principles and as to their application under the conditions actually encountered in the field. Much has been written on the subject both as to theory and to practice, especially on the air-lift as applied to lifting water. Many claims have been made as to the use and benefits of the gas-lifts, some of which are reasonable, but many of which are unreasonable, many specialty makers claiming to have devices which operate in almost miraculous ways and even to generate energy nature never possessed. Upon examination, these claims are often found to be based upon incomplete or inaccurate data.

A review of the literature discloses many valuable articles and it seems unnecessary for the writers at this time to cover the ground generally, but a review of this literature also discloses the need for setting out more clearly the different practical ends sought and for working out specific engineering principles upon which to formulate the design and operation of gas-lifts to meet the desired ends within the limitations of field conditions. Also a check on some of the published information has disclosed basic errors in the sources of data upon which conclusions have been predicated, which, in the minds of writers, has thrown a general element of doubt as to a large part of the compiled data.

The writers have, therefore, concluded that at this time it would be opportune to direct discussion to the sources of error in the data now being collected, to recommend for consideration by the engineers some methods of collecting and collating data, and to point out some of the factors relating to the application of the air-lift principle to oil production as dictated by the different economic ends sought and the limitations of working conditions that may be met. Until these several considerations are clearly in mind by the engineers and the unreliable data has been sifted out and dependable data substituted, there seems little chance of evolving satisfactory engineering control for the air-lift. In the following pages no distinction will be made between gas and air-lift as they are generically the same.

The Ends Sought

First, let us consider the ends sought in applying the air-lift. These will always be practical and not theoretical, though in arriving at a satisfactory solution of a practical end, it is absolutely necessary to have correct guiding principles. Without endeavoring to make a complete outline of the ends sought, we will give a few main considerations and some of the practical limitations:

A review of the conditions to which the air-lift has been applied since its introduction a few years ago will disclose that in many instances the primary consideration was to increase the daily production to the greatest extent regardless of all else. This is well illustrated at Seminole, where almost the only gauge of efficiency under the highly competitive conditions there was the increase in daily production.

A second consideration was for a cheaper method of lifting the oil—both as to installation and operating costs.

A third consideration was that in the very deep and crooked rotary holes that have been drilled in recent years, it was often unpractical and sometimes even impossible to use the old deep well plunger pump. This problem was the chief reason for the revival of the air-lift in California.

The fourth purpose is the use of the air-lift as a means of increasing oil recovery as distinct from oil production. This results in a consideration of the effect of the back pressure caused by the air-lift upon the expulsion by the oil sand as measured by the gas-oil ratio, though as pointed out in the following pages, the ratio of volume of gas to oil alone is not a correct criterion of measuring recovery efficiency.

In considering these four main ends sought, it is obvious that they will not be reconcilable and that the design and operation of a gas-lift will differ with the different standards of efficiency. Of

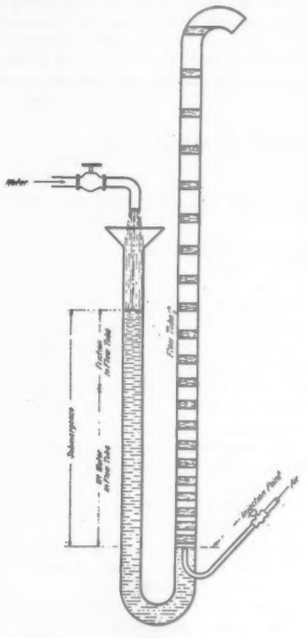


FIGURE 1

course, there will not always be a clear distinction between the ends sought, which often will be a combination of two or more factors, but always the final end will be what the operator thinks the most profitable manner of operation under the existing circumstances. It will be the problem of the engineer to work out and then convince the operator as to what the most profitable manner of operation will be, but to accomplish these purposes the engineer must be well fortified with the data which will enable him to design and operate his apparatus so as to fit the specific need most satisfactorily.

Practical Limitations

In working out these problems, the engineer will be faced usually with very definite practical limitations. For example, in the use of tapered tubing, the engineer will be limited to the size of the casing and he will be unable to use the graduations of flow pipe which would otherwise give the best results for a well to which the air-lift is being applied.

There will also be many other limitations; such as the back pressure, the occurrence of water with the oil, and the emulsibility of the oil with the water, the size of the well equipment already on the ground, the relation of the air-lift to gasoline extraction, the rock pressure and natural gas volume, whether or not the lift can be made continuous or intermittent, and many other factors which need not be mentioned here, as our primary purpose is illustrative and not enumerative.

But the main point is that theory must finally be adapted to the practical needs and what the engineers need are guiding principles and accurately gathered and analyzed data, which will enable the design of the proper installation with the least delay and the least necessity for experimentation.

Theory of the Air-Lift

The elements of the air-lift are shown in Figure 1. A U-tube is shown, one arm of which represents the submergence, the other the eduction, or flow tube. Water flows continuously into one arm, where it reaches a level that counterbalances both the pressure at point of injection in the flow tube and the pressure of the aerated column above the injection point.

It can be seen at once that the three pressures must be nearly equal at the point of injection, the weight of the water in the flow tube plus the friction being but slightly less than the weight of the water less the slight friction in the submergence tube and also slightly less than the pressure less the friction in the air-feed pipe. The water feeds continuously past the injection point and the air as continuously enters the upward moving column and carries it up and out of the flow pipe under the slightly unbalanced conditions. If the water is fed in more rapidly, more air will be needed to remove it and to maintain the same level in the submergence tube. If the volume of air decreases, the submergence will be increased, which will require a higher air pressure, and if the ingress of water is too rapid, it may overcome the air pressure and volume available and fill up both sides of the U-tube, stopping the flow. If the water flow is decreased, the submergence will be decreased, and the pressure at the injection piont will be decreased likewise, but if the rate of water feed is dropped too low, the air will not lift the water and may pass alone up the flow pipe or water may accumulate in the flow and the air pass out through the submergence tube.

FIGURE 2

It will thus be seen that the air-lift consists of a balancing and proportioning of parts, pressures and volumes. For a continuous air-lift, the necessary elements are a pressure that will feed in the liquid to be lifted against the lift pressure and an equal pressure to feed in the air or other gas, the liquid pressure confining the gas pressure and directing its flow upward. The volume of the gas together with the pressure must equal the foot pounds of energy to lift the liquid against the frictional resistance together with the waste of energy caused by slippage or drop back of the water in the upflowing column. Thus the air pressure is controlled by the weight and frictional resistance in the flow tube and the volume is controlled by the energy required at the pressure to overcome the weight and friction plus the quantity of air wasted by reason of slippage.

In a naturally flowing oil well, the oil is fed into the bottom of the hole by means of the gas pressure and there is sufficient volume and pressure of gas to make a natural gas-lift from the bottom of the well to the surface, but when the volume or pressure of the gas becomes insufficient, then it is necessary to add additional quantities of gas or air from the surface.

Figure 1 is diagrammatic and therefore the flow is shown as a series of separate slugs of water, whereas in fact a well designed air-lift would show at the bottom of the well a mixture of finely divided bubbles of gas in the water and near the top, droplets of water in the air. Figure 1 also shows with approximate accuracy the upward expansion of the air and the relative submergence which would be necessary to confine and balance the air injection and flow pressures. The total thickness of the slugs will give the total weight of the column, to which must be added the back pressure resulting from friction.

In Figure 2 is shown the principles of the intermittent air-lift. The fluid accumulates in the bottom of the well or in a chamber at the bottom of the well when the pressure is off the sand and then air pressure is let into the chamber, which forces the fluid down and up into the eduction pipe, a portion of the air passing through an aperture in the pipe and aerating the column above the injection point. The flow continues until the fluid is out of the chamber, whereupon it is necessary to let a new charge of fluid accumulate in the well.

It is apparent in Figure 1 that if the pressure is not maintained in the U-tube, air will flow up the U-tube instead of lifting the water. This occurs in an oil well when the rock pressure becomes lower than the lifting pressure. The air or gas backing up into the sand and forcing the oil away from the well instead of lifting it into the well. As a well gets older, this condition is met at some point and it becomes necessary to design and operate the air-lift with lower and lower pressures until finally it may become necessary to flow the well intermittently by means of a chamber arranged in some practical manner if the sand is open, though in tight sands the well often will act satisfactorily as a chamber itself. Another, and more desirable alternative, is to maintain rock pressure by injecting air or gas into the sand in nearby wells.

Figure 1 shows how the gas expands upstream in the pipe. The relative spaces between the slugs of water show not only the expansion but the relative velocity of the flow of gas and water. To keep the velocity constant the cross section of the pipe must be increased in proportion to the expansion of the gas. In Figure 3 is shown with approximate accuracy the increase in the cross-section of pipe that would be necessary to maintain a constant velocity in the upflow of the water and the air.

Elements of Mechanical Efficiency

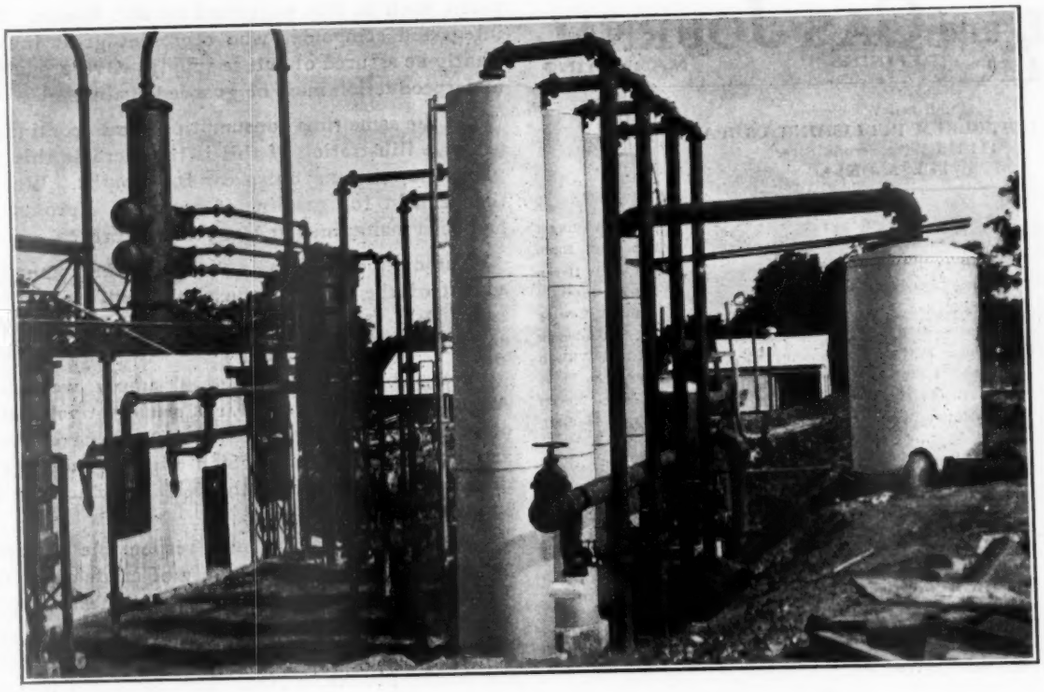
The three main elements consuming energy in the eduction of the liquid are (1) the weight of oil and the distance lifted, (2) the frictional resistance of the upward moving column of oil and gas, and (3) the slippage or dropback of the oil in the upward flowing gas. The first represents the useful work to be done, and, of course, is irreducible, hence efforts to increase mechanical efficiency must be directed to decreasing friction and slippage.

Friction increases with velocity according to well-known laws, but in the air-lift it is difficult to determine a friction constant for a well, and as there is an acceleration of velocity from the bottom to the top of the flow pipe, the com-

(Continued on Page 103)

*Before midyear meeting, Petroleum Division, A. I. M. E., Fort Worth, Tex.

Copyright, American Institute of Mining and Metallurgical Engineers.



The Sinclair Oil and Gas Co's. NEWTON ABSORPTION PLANT at Seminole

No further proof of the efficiency and economy of Newton Plants is required by prospective owners, once their widespread popularity among the largest refiners and natural gasoline manufacturers is established as a fact.

For the largest operators are naturally the most careful buyers of equipment. And their approval of Newton Equipment is expressed in unmistakable terms of dollars and cents; it is responsible for the remarkable volume of sales that Newton enjoys in every oil producing state in the Union.

Above is shown one of several Sinclair plants equipped with Newton Absorption equipment. Sinclair has found Newton equipment to be, truly the "profit process." You will, too, when you install Newton.

Representatives

HURLEY BROTHERS
Kennedy Bldg.
TULSA, OKLA.

THE NATIONAL SUPPLY CO.
General Offices, Toledo, O.,
and All Stores

Foreign Representatives

THE NATIONAL SUPPLY CORP.
120 Broadway
NEW YORK

MOST EFFICIENT—MOST ECONOMICAL

"Newton Process Is the Profit Process"

NEWTON PROCESS

MANUFACTURING COMPANY

FULLERTON, CALIFORNIA

The OIL and GAS JOURNAL

PRODUCING REFINING MARKETING

Published Weekly by
THE PETROLEUM PUBLISHING COMPANY
114-116 West Second Street
TULSA, OKLA.

Established as an International Publication in 1910 by Patrick C. Boyle

President - - - - - - - - - - - - Frank T. Lauinger
Vice President and General Manager - - Robert W. Egan
Secretary-Treasurer - - - - - - - - - - W. T. Bryan
Editor - - - - - - - - - - - - - James McIntyre
News Editor - - - - - - - - - - - Andrew M. Rowley
Associate Editor - - - - - - - - - - W. T. Anderson
Refinery Editor - - - - - - - - - - - C. O. Willson
Technical Editor - - - - - - Charles K. Francis, Ph.D.
Advertising Manager - - - - - - - - - Clarence Morris
Circulation Manager - - - - - - - - - - J. P. Mulkern

DISTRICT ADVERTISING OFFICES
C. L. CAIN - - Room 629, 101 Park Ave., NEW YORK CITY
E. KLAPPENBACH, 1328 Peoples Gas Bldg., CHICAGO, ILL.
ALVIN E. LOEFFLER State Theater Bldg., PITTSBURGH, PA.

TERMS OF SUBSCRIPTION
(By Mail, Postage Prepaid)

Single copies - - - - - - - - - $ .15
Three months - - - - - - - - - $2.00
Six months - - - - - - - - - $3.00
One year (in United States) - - - $6.00
One year (in Canada) - - - - - $7.00
One year (foreign countries) - - - $7.00

ADVERTISING RATES ON APPLICATION
Telephones: 6291-6292-6293
Remittances by Checks, Drafts, Express or Postal Money Orders should be made payable to
The Petroleum Publishing Company
Cable address, "Oilgasnal"

MEMBER AUDIT BUREAU OF CIRCULATIONS

AFTER SEMINOLE—WHAT?

The oil industry is beginning to sense a change in the situation.

The measure of Seminole has been taken. The worst is known. That in itself is always encouraging.

West Texas may loom ahead but even an equal flood of West Texas crude could not have as disastrous effects on the industry's condition as the production of Seminole's superior oil.

And, as President E. B. Reeser of the Barnsdall Corporation says in an article elsewhere in this issue of The Oil and Gas Journal, there never was a field like Seminole and it is not likely we are going to see another.

Furthermore, the production from Seminole was so speeded up that an output was produced in ten months that would have been spread over four or five years under former methods. The flood was higher but it left less oil to move.

Seminole may therefore be regarded as definitely passing out of the picture, leaving the question to be discussed, what after Seminole?

The possibilities of West Texas have been so impressively presented that no one can safely underestimate them. The fact remains that, even at the highest prediction, they should not have anything like the upsetting effects of Seminole.

Besides the matter of the characteristics of the crude there is the hopeful fact of actual co-operation to regulate production, which had to be fought for while Seminole production swelled, but is in operation before West Texas begins development.

The lesson the industry learned at Seminole is going to be an effective warning against like errors in West Texas or elsewhere.

The consensus of opinion is that California's output will continue to decline to around 600,000 barrels by the end of the year. The shut in production there, instead of menacing the market, is a guarantee of conservative operation.

It is not necessary to wait for production to fall below consumption to recognize that prospective conditions in the Mid-Continent, West Texas and California, the three great producing areas, are much more encouraging.

This conclusion is strengthened when a longer range survey is taken, such as that suggested by Mr. Reeser. Executives of large integrated companies who represent great investments must constantly be assured of future supply. Overproduction is unexpected; underproduction must be guarded against.

At the same time consumption grows continually. The most impressive illustration of this is the increase this year with the Ford plants not turning out a car for months. What would have been the demand for gasoline if automobile production, thus reduced, had been maintained at last year's figures?

Automotive opinion is that with the competition following the advent of the new car the public will be assured of the greatest automobile values in history, inviting unprecedented buying and corresponding increase in the consumption of motor oils.

Yet gasoline stocks, in days' supply, were lower at the end of August than for years and it is conservatively estimated that by the close of the year there will be 150,000 barrels daily less Oklahoma and Kansas crude from which twice as much gasoline can be produced as from the oil in the fields to which the industry looks for supplying that deficiency.

No wonder then that men responsible to great investments dependent upon an assured supply of crude are looking beyond West Texas and asking where the next domestic supply can be found.

Mr. Reeser directs his comment to the common assumption that all the oil we will need in the immediate future can be obtained from the Rocky Mountain area. The facts and figures he cites do not show it.

Market conditions in the industry last year were inviting enough to have developed some evidence of this productiveness in that region if such production existed. But outside of Salt Creek the production of the four states has increased only about 25,000 barrels a day, with the most promising structures tested.

There may be and probably are hidden pools in those states but the geological structure limits their size and the difficulties in drilling restrict their development with crude at present prices.

The proportion of dry holes to completions, outside the proven areas, and located on the judgment of the most experienced men on the staffs of large companies, indicates the hazard of hoping for large reserves of petroleum in that region.

Mr. Reeser's information shows 41 per cent dry holes in Wyoming outside of Salt Creek; 59 per cent in Montana outside of Sunburst; 51 per cent in New Mexico outside of Artesia, and 54 per cent in Colorado, during 1924, 1925 and 1926.

If those are the conditions on which we are to depend in maintaining a domestic supply of 2,250,000 barrels a day it is time to be thinking about it.

People have got into the habit of thinking there can be only optimists or pessimists. Actually, of course, both represent extremes beyond the main body of sound opinion.

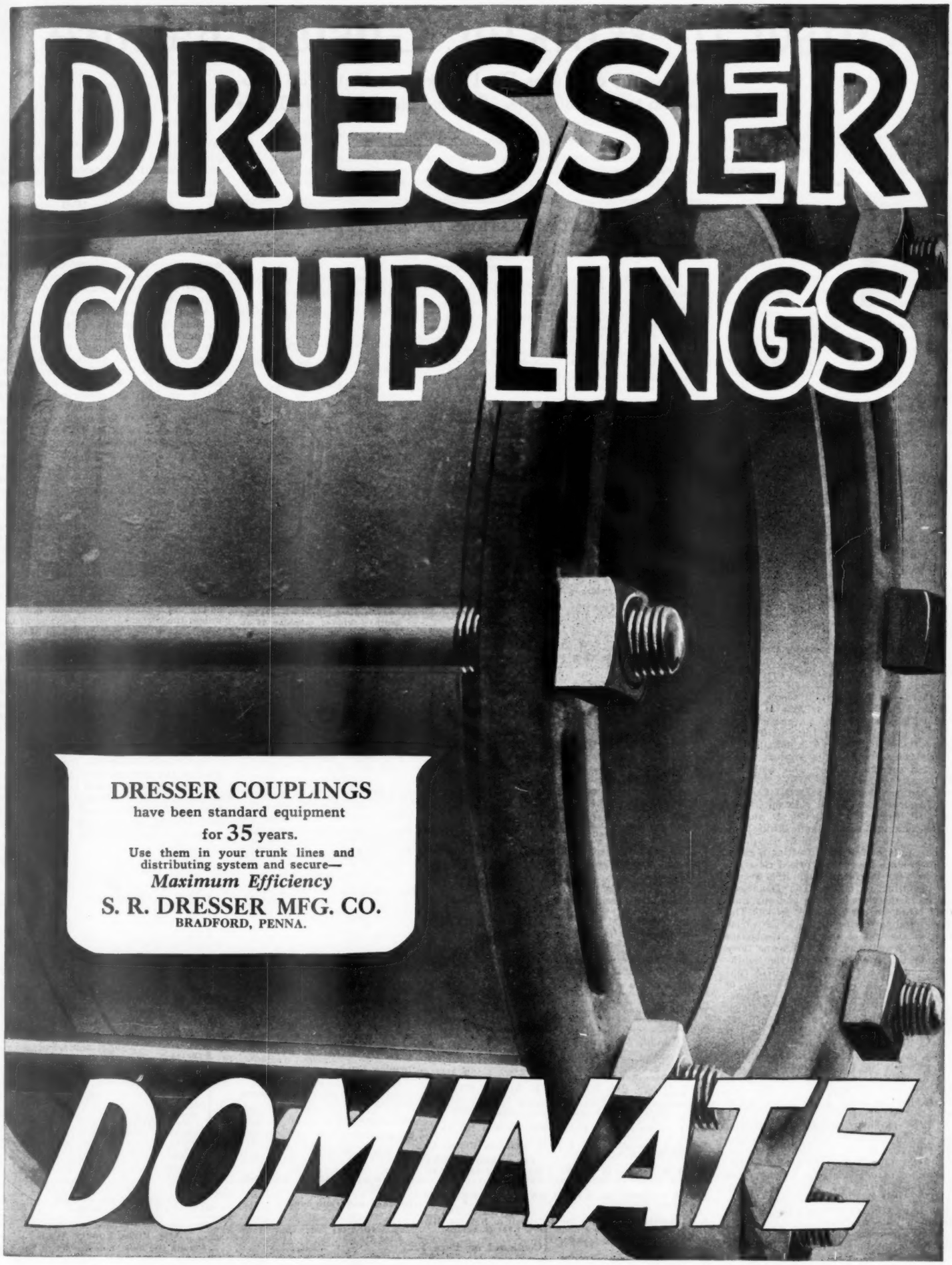
In periods of overproduction the pessimist tells us we shall never get out from under. If production begins to drop the optimist thinks $3.50 oil is just around the corner. But we have had other periods of overproduction and declines in production without either prediction being fulfilled.

Production leaps up and falls down but consumption climbs steadily. Seminole has been phenomenal in size and prolongation but its effects will be over sooner while demand continues its unshaken upward course.

The industry will be in greater danger next year from Congress than from West Texas.

The feeling that the situation in the industry is changing for the better is justified by the outlook. The pessimists are being routed but we must be on guard against the no less misleading optimists who would run before they can crawl. At the same time the records show that the industry rebounds from depressions much faster than it recognizes danger signals.

It is pre-eminently the most hopeful of industries. Had it not been for that adventurous buoyancy it never could have accomplished the miracles it has achieved.


DRESSER
COUPLINGS
DRESSER COUPLINGS
have been standard equipment
for 35 years.
Use them in your trunk lines and
distributing system and secure—
Maximum Efficiency
S. R. DRESSER MFG. CO.
BRADFORD, PENNA.
DOMINATE

Offset to Winkler Gusher Failure

Regauging of Yates Pool Increases Potential Production to 212,000 Bbls. Several New Gushers There

By C. D. Lockwood
Staff Correspondent, North and West Texas

FORT WORTH, Tex., Oct. 17.—The failure of a Winkler County test offsetting a 5,100-bbl. producer and which was confidently expected to make a gusher rivaling its offset was the outstanding sensation of West Texas this week. The regauging of the Yates Pool producers in accordance with the proration plan which was started October 1, the appearance of water in a fourth Yates Pool well, and the completion of several new gushers in that field gauging as high as 545 bbls. an hour all took their share of attention but the Winkler County development ranks first in importance.

The Hendricks Pool has been regarded as perhaps the greatest potential field yet discovered in West Texas, and the most dangerous from a crude market standpoint. Due to the manner in which Westbrook and his associates financed the discovery well it has been cut up into 5-acre and 10-acre tracts, and since development has indicated a large producing area the owners of these tracts have made drilling contracts which require many offsets. Nearly every week of late, one of these 10-acre tracts would appear on the map with a location in the middle of it, necessitating companies on all four sides to protect themselves.

This week there are 74 operations in the Hendricks Pool, including six new locations, and the situation has been rapidly getting beyond control.

Operations in Hendricks Pool

Now, the Southern Crude Oil Purchasing Co.'s No. 1 Hendricks T-67-A, in Section 4, Block B-12, east offset to Southern Crude and Westbrook's No. 1 Hendricks T-88-B, is drilling at 3,100 feet with no showing of oil, gas nor water. It topped the Big Lime at 22 feet below its west offset and is now drilling nearly 200 feet below the point at which No. 1-B got the big pay. This well, No. 1-B, made 100 bbls. at 2,785-2,807 feet but had the big pay at 2,907-12 feet, flowing more than 7,000 bbls. on its big day. It came in September 9 and is still averaging better than 5,100 bbls. daily.

This failure of a test offsetting a gusher to produce has not surprised close observers very much, although it is keenly disappointing to many. The Hendricks pay is in the Permian lime and any lime field is apt to perform such tricks. The most puzzling feature of all, is the variation in the top of the lime. Geologists are slowly and thoughtfully erasing their contour lines, for not only is the Southern Crude's No. 1 Hendricks T-67-A running lower than No. 1 T-88-B. So is Landreth and Roxana's No. 1 Hendricks, in the SE cor. SW of Section 29, Block B-5, just a quarter of a mile north of the 5,100-bbl. producer. It found the top of the lime at plus 129 feet, or 25 feet lower than the producer. Roxana Petroleum Corp.'s No. 1 Hendricks-B, east offset to its joint test with Landreth, is also reported to have topped the lime lower, but the exact depth is not available.

Up in the north part of the field, Republic Production Co.'s No. 1 Hendricks-A, NW cor. E half SW, of Section 45, Block 26, topped the lime at 2,125 feet, according to one analysis, which makes it 720 feet above sea level, the highest well in the field, and 433 feet higher than Landreth and Roxana's test, a quarter of a mile westward.

Some observers voice the opinion that the top of the lime in this area has been eroded and that subsurface contouring on this formation will be valueless except in a very general way. Certainly production has little relation, so far, to the lime contours. Much needs to be known about this field before an estimate of its potentialities can be made, although it seems apparent that gushers are destined to offset dry holes much as they do in other lime fields.

Biggest Gas Well

The biggest gas well yet brought in is Humble Oil & Refining Co.'s No. 2 Hendricks, in the SE cor. NE, Section 34, Block B-5. This well is a diagonal northwest offset to Murchison, Cranfill and Maryland's producer, and it gauged 55,000,000 feet of gas at 2,540 feet. It was shut down for orders.

About 3 miles northwest of the field, Humble Oil & Refining Co.'s No. 1 T. G. Hendricks, Group 1, in the C SE, Section 36, Block 27, picked up sulphur water at 3,222 feet and had a hole full of it at 3,258 feet. This is not a surprise as the lime was topped at 264 feet below sea level and observers generally expected the test to be a failure.

Independent Oil & Gas Co. has put on well connections at its No. 1 Ida Hendricks, in Section 34, offsetting the Gulf lease, and is drilling at 2,667 feet. No. 2 is also drilling ahead at 2,504 feet. It is understood that the company plans to obtain production and offer this property for sale.

New Yates Pool Gauge

The first semimonthly meeting of Yates Pool producers in regard to the pipe line proration plan was held in Fort Worth last week and was well attended. No complaints were made against the committee in charge, and the only change in rules that resulted was a decision to gauge old producers only once a month unless the owners desired it. The gauges taken last Friday, Saturday and Monday, therefore, included only 14 wells, whereas, there are 30 producers in the pool and more are being added daily.

The new gauges increased the potential production of the field from approximately 170,000 bbls. October 1, to about 212,000 bbls. October 15. The pipe line capacity remains at 30,000 bbls. daily and the carriers are only slightly behind that schedule. The Illinois Pipe Line Co.'s 132-mile 8-inch line from the Yates Pool to Del Rio has been completed and it is expected that it will be tested about October 20. This will add about 14,000 bbls. to the capacity and will add just that amount to the daily average production. Following are the recent gauges:

Company and well—	Gauge Sept. 29	Gauge Oct. 15-17
Allsman & Bell:		
1 River Bed	4	4
California Co.:		
1 Yates	488	*567
3 Yates	...	*484
4 Yates	...	*172
Gulf Prod. Co.:		
1 Smith	70	*90
1 Thompson	19	0
Humble O. & R. Co.:		
1 Smith	...	*66
Marland Oil Co.:		
1 Yates-A	377	377
McMan and Marland:		
1 Yates	318	*302
2 Yates	...	*552
3 Yates	...	*90
Mid-Kansas and Transcontinental:		
1 Yates-A	150	150
2 Yates-A	833	833
3 Yates-A	100	100
4 Yates-A	302	302
5 Yates-A	213	213
6 Yates-A	1,050	*1,045
7 Yates-A	787	787
1 Yates-B	818	818
2 Yates-B	231	231
3 Yates-B	657	*762
1 Yates-C	222	222
1 Smith-Taylor	180	180
2 Smith-Taylor	...	*155
Red Bank Oil Co.:		
1 Smith	...	*43
Roxana Pet. Corp.:		
1 Smith	...	*57
1 Tippett	...	*203
Simms Oil Co.:		
1 Smith	114	*153
Total gauge for 1 hr. 28 wells		8,858
Rate of 212,592 bbls. daily.		

*Indicates well gauged this time.

New Pecos County Wells

Among the most noteworthy of the new

WILDCAT OPERATIONS IN WEST TEXAS

Week ending October 15, 1927

Company, Farm and Location—	Remarks—
ANDREWS COUNTY	
Calvin & Belt's No. 1 Ratliff & Bedford, C NE, Sec. 16, Blk A-54	Running 12-in. 675 ft.
J. S. Cosden's No. 1 Ratliff & Bedford, C SE Sec. 8, Blk. 73, Public School Land	Top salt 1,585 ft.; drilling 1,635 ft.
Sartain Oil Co. et al's (was Deep Rock Oil Co.'s) No. 1 W. J. Harris, C SE Sec. 13, Blk. A-46, Public School land, elev. 3,167 ft.	Hole full fresh water 1,050 ft.; drilling by bailer 1,130 ft.
B. B. McKennon's (was Neff et al's) No. 1 J. S. Means, C SE Sec. 12, Blk. A-35, Public School Land	Shut down 1,020 ft. for 10-in. casing.
A. G. Carter & Zweifel's No. 1 Cowden, C SE Sec. 18, Blk. A-52, Public School Land Sur., elev. 3,156 ft.	Top salt 1,375 ft.; encountered pocket of air 3,635 ft.; shut down for orders 4,503 ft.
BORDEN COUNTY	
Marland Oil Co.'s No. 1 G. E. McDavid, C SW Sec. 156, Blk. 25, H. & T. C. Sur.	Location.
BREWSTER COUNTY	
Cady & Keller's No. 1 Decies	Rig on ground.
Mid-Kansas O. & G. Co.'s No. 1 Turney, Sec. 77, Blk. 213, T. & St. L. Sur.	Drilling 500 ft.
Reese & White's No. 1 Kimbale, C NE Sec. 304, Blk. 9, G. H. & S. A. Sur.	Location.
Van McPhail's No. 1 McIntyre, SE cor. Sec. 59, Blk. 352, 7 mi. S of Alpine	Shut down for bailer 1,025 ft.
Wilcox & Anderson's No. 1 Gage, Sec. 8, Blk. 300, T. C. R. R. Sur.	Shut down for 8-in. 1,000 ft.
COKE COUNTY	
W. H. Brown et al's No. 1 W. L. Foster, SE cor. Sec. 142, Blk. 2, H. & T. C. Sur., elev. 2,222 ft.	Shut down 2,250 ft.
Danciger O. & R. Co.'s No. 1 Mrs. Byrnes, Clinton Sur.	Running 8-in. 2,770 ft.
Lipan Oil Co.'s No. 1 S. M. Conner, Sec. 71, Blk. 2, H. & T. C. Sur.	Show oil 1,224-34 ft.; drilling 1,690 ft.
Lipan Oil Co.'s No. 1 E. C. Rawlings, Sec. 390, Blk. 1-A, H. & T. C. Sur., elev. 2,750 ft.	Fishing bailer 2,736 ft.
CONCHO COUNTY	
The Exploration Co.'s No. 1 Hartgrove, Blk. 340, J. Schouch Sur., elev. 1,718 ft.	Junked hole 1,670 ft. (corrected depth); skidded machine 25 ft. north; drilling 470 ft.
CRANE COUNTY	
Marland Oil Co.'s No. 1 Union Land, E cor. of W ½ Sec. 28, Blk. 35, H. & T. C. Sur., elev. 2,298 ft.	Top salt 825 ft.; 1,300 ft. sulphur water at 2,100 ft.; drilling 2,205 ft.
Duffey & Gault & Brown's No. 1 Cowden	Drilling 300 ft.
Gulf Production Co.'s No. 2 W. N. Waddell	Total depth 3,500 ft.; flowing 30 bbls. daily; rigging up to deepen.
J. K. Hughes Dev. Co.'s No. 1 State Bank Commission, CSL, Sec. 18, Blk. 4, H. & T. C. Sur.	New location.
CROCKETT COUNTY	
George Anderson and Marland Oil Co.'s No. 1 University	Hole full sulphur water 1,800 ft.; one-half bailer oil 2,240 ft.; one-half bailer sulphur water per hour 2,475 ft.; shut down 2,631 ft.
V. T. Bolin & Co.'s No. 1 P. C. Coates, NW cor. SW Sec. 4, Blk. 2, I. & G. N. Sur.	Shut down 2,110 ft.
Corbett & Gill's No. 1 University	Set 8-in. 1,155 ft.
J. S. Cosden, Inc., No. 1 Paul Perner, SW cor. Sec. 36, Blk. 2, I. & G. N. Sur.	Rig.
Cushing Refining & Gasoline Co.'s (was P. H. Williams') No. 2 L. P. Powell	Fishing casing; 250 ft. oil in hole from 2,604-27 ft.
Gulf Production Co.'s No. 2 Powell-D	Top salt 1,060 ft.; top lime 2,490 ft.; swabbed 90 bbls. in 3 hours 2,590-2,607 ft.; 1,800 ft. oil and 700 ft. water after 10 hours.
Gulf Production Co.'s No. 2 G. L. Thompson, Sec. 71, Blk. 1, I. & G. N. Sur.	Drilling 547 ft.
Epeneaur et al's No. 1 Noelke, SW Sec. 36, Blk. GG, G. C. & S. F. Sur.	Shut down 620 ft.; fishing.
C. A. Jones et al's No. 1 Powell	Fishing tools 660 ft.
James Kelly et al's (was Corbett & Gill's) No. 1 Todd, C NE Sec. 43, Blk. WX, G. C. & S. F. Sur.	Drilling 1,060 ft.
J. S. Kimbrought's No. 1 H. M. Halff	New location.
Van McPhail's No. 1 George Thompson	New location.
Magnolia Petroleum Co.'s No. 2 Shannon	Show oil 2,385-90 and 2,992 ft.; total depth 4,100 ft.; fishing 30 joints 8-in. casing.
Newman Oil Co.'s No. 1 B. C. Clark	Rigging up.
William Shaffer et al's No. 1 University, C SE SE Sec. 9, Blk 47 University Sur., elev. 2,344 ft.	Shut down 2,344 ft.
William Schaffer et al's No. 2 University, 1,250 ft. N and 2,610 ft. E of SW cor. Sec. 9, Blk. 47, University Land	Top salt 1,060 ft.; first oil show 2,190-96 ft.; second 2,225-29 ft.; 1 bailer oil in 10 hours at 2,590 ft.; drilling 2,635 ft. brown lime.
W. W. Donnelly & Young's No. 1 Massey, Sec. 29, Blk. U-V	Drilling 200 ft.
W. W. Donnelly, Young, Logan & Hult's No. 1 Pierce, C SW Sec. 150, Blk. O, G. H. & S. A. Sur., elev. 2,105 ft.	Total depth 3,240 ft.; shut down.
McMannon Oil Co.'s No. 1 Blakeney	Drilling 2,585 ft.
World Oil Co.'s No. 1 Schneeman-B, Sec. 50, Blk. BB, G. C. & S. F. Sur.	Shut down 800 ft.
World Oil Co.'s No. 1 Powell, Sec. 52, Blk. BB, G. C. & S. F. Sur.	Location
Young & Donnelly's No. 1 J. M. Shannon, C Sec. 11, Blk 9, D. & S. E. Sur.	Set 8-in. 1,100 ft.
CULBERSON COUNTY	
James H. Gardner et al's No. 1 Radford, C SE Sec. 29, Blk. 62, Public School Land Sur.	Shut down at 585 ft. for 10-in. casing.
Scott & Dittman's No. 1 Miller, SW cor. NW NE Sec. 1, School Blk. 97	Spudded and shut down.
ECTOR COUNTY	
J. S. Cosden, Inc., et al's No. 2 Connell-A, NW cor. NE Sec. 13, B-16, School Land, elev. 2,844 ft.	Top pay 3,471 ft.; shut down 3,515 ft.

(Continued on Page 172)

Pecos County wells was McMan and Marland's No. 2 Yates which flowed 545 bbls. the first hour at 1,291 feet where it topped the big pay. This well flowed 5 bbls. an hour at 1,120-33 feet, also and cemented the 6-inch at 1,204 feet. The California Co.'s No. 1 Smith was also a big producer. flowing 500 bbls. in one hour at 1,330-31 feet. Roxana Petroleum Corp.'s No. 1 Smith-A flowed 418 bbls. in 24 hours at 1,537-62 feet, but No. 1 Tippett flowed 203 bbls. in one hour at 1,356-1,400 feet.

The fourth water well in the Yates Pool is Mid-Kansas Oil & Gas Co. and Transcontinental Oil Co.'s No. 3 Yates-B, in the SE cor. of Section 61, offsetting the Allsman & Bell producer in the river bed, and the Marland O'l Co.'s No. 1 Yates-A, both of which have been making water for several weeks. On the test made this week for the proration committee, No. 2-B flowed 762 bbls. in one hour through two 3 inch lines and one 4-inch. Monday it was reported flowing 5,000 bbls. daily, with 15 per cent water at the well. Three tanks of oil were turned down because of water content, ranging as high as 9 per cent.

Marland O'l Co.'s No. 1 Yates is averaging about 40 to 50 per cent water and the Gulf Production Co.'s No. 1 Thompson, across the river, was shut in after it went entirely to water. The encroachment of water in Mid-Kansas' No. 3-B was to be expected. although this well is supposed to be about 45 feet higher structurally than Marland's No. 1 Yates-A, and the encroachment on the field seems to be going on rather fast, considering how the wells are shut in.

New Locations

Th'rty-eight new locations were added to the list of operations in West Texas during the past week, making a grand total of 98 in the past three weeks. This rate of activity seems likely to be maintained during the next few weeks to come, also, because several of the locations reported at this time call for one or more offsets.

WEST TEXAS COMPLETIONS

Dawson County

R. R. Penn and others' No. 1 Wright encountered 200 feet of sulphur water at 4,155 feet and was abandoned at that depth.

Howard County

Magnolia Petroleum Co.'s No. 6 Mary Chalk swabbed 87 bbls. after a 40-quart shot in sand at 1,675-94 feet, total depth 1,695 feet. Sweeney and associates' No. 1 Chalk (formerly No. 2 Chalk) swabbed 150 bbls. after a 60-quart shot. It swabbed 75 bbls. natural at 1,634-51 feet, total depth 1,669 feet.

Jones County

Marston Oil Co.'s No. 1 E. Howell was dry and abandoned at 2,547 feet.

Mitchell County

California Co.'s No. 6 C. M. Adams, Lease 2, topped the pay at 2,945 feet and at 3,075 feet swabbed 42 bbls. It was shot with 290 quarts from 2,950 to 3,070 feet, making 81 bbls. afterward.

Nolan County

John W. Winemiller Corp.'s No. 1 W. L. Booth was a failure at 3,212 feet.

Pecos County

Humble Oil & Refining Co.'s No. 1 Smith flowed 66 bbls. in one hour at 1,488-1,600 feet and was shut in.

McMan & Marland's No. 2 Yates flowed 545 bbls. the first hour at total depth of 1,291 feet, which was also the top of the big pay. This well topped the first pay at 1,112 feet and flowed 5 bbls. an hour at 1,120-33 feet. Same company's No. 3 Yates flowed 60 bbls. the first hour at 1,235-1,358 feet and was shut in; No. 4 flowed 70 bbls. the first hour at 1,290-1,355 feet and was likewise shut in.

Mid-Kansas & Transcontinental's No. 2 Smith-Taylor was flowing 110 bbls. hourly at 1,374 feet. This well topped the pay at 1,255 feet and flowed 170 bbls. in 18 hours by heads at 1,255 feet.

Roxana Petroleum Corp.'s No. 1 Smith-A was shut down at 1,562 feet and flowed 418 bbls. in 24 hours from pay topped at 1,537 feet. This well had a small show of oil at 1,435-87 feet. Same company's No. 1 J. H. Tippett flowed 203 bbls. in one hour at 1,356-1,400 feet. It had a small show of oil and gas at 1,332 feet.

The California Co.'s No. 1 Smith flowed 500 bbls. in one hour at 1,330-31 feet. It had a small show of oil at 1,250-55 feet.

Buell & Hagan's No. 1 Jasper County School Land is being abandoned at 2,902 feet.

Upton County

Tidal Oil Co.'s No. 2 Burleson pumped 10 bbls. of oil and a like amount of water at 2,080-90 feet.

NORTH TEXAS COMPLETIONS
RANGER DISTRICT

Brown County

Gilman & McMurray's No. 1 Kilgore was dry and abandoned at 1,203 feet. Humble Oil & Refining Co.'s No. 3 Gilbreath made 260 bbls. at 1,301-15 feet. McMurray and associates' No. 15 Newton was good for 5 bbls. after a 10-quart shot at 1,257-67 feet, total depth 1,270 feet.

Phillips Petroleum Co.'s No. 4 Newsome made 240 bbls. at 1,326-44 feet.

Roxana Petroleum Corp.'s No. 8 Smith was a 6-bbl. well at 1,314-23 feet, total depth 1,354 feet; No. 21 Smith made 88 bbls. at 1,309-28 feet; No. 22 Smith was a 40-bbl. well at 1,307-26 feet, total depth 1,328 feet; and No. 24 Smith produced 91 bbls. from sand at 1,322-31 feet, total depth 1,332 feet.

Scrivenor and others' No. 1 Truehart pumped 10 bbls. at 1,103-15 feet following a shot of 10 quarts. Total depth is 1,402 feet.

Sinclair Oil & Gas Co.'s No. 6 Smith made 215 bbls. at 1,325-33 feet; No. 7 Smith was a 400-bbl. well at 1,324-41 feet.

E. L. Smith Oil Co.'s No. 1 Moore was good for 154 bbls. at 1,270-88 feet; No. 8 Smith made 800 bbls. at 1,318-40 feet; No. 18 Smith was good for 610 bbls. at 1,320-42 feet.

Wheelock & Collins' No. 1 Smith made 280 bbls. at 1,339-51 feet.

Callahan County

Navarro Oil Co.'s No. 5 Bennett-Booth was a 50-bbl. producer at 1,631-43 feet. Shaw and others' No. 9 Miller made 10 bbls. from sand at 1,617-19 feet, total depth 1,654 feet.

Coleman County

Cheney and others' No. 1-C Overall made 50 bbls. initial from sand topped at 1,605 feet and drilled to 1,610 feet, with the bit still in sand. The 8-inch pipe was set at 1,610 feet with 6 feet of perforated nipple.

Kenwood Oil Co.'s No. 1 Ward made 3,000,000 feet of gas at 592-600 feet.

Eastland County

Barkley and others' No. 1 Duffer made 27,000,000 feet of gas and 161 bbls. of oil at 2,980-98 feet. Lewis, Trustee's No. 1 Fox pumped 8 bbls. after a 40-quart shot at 1,548-60 feet, total depth 1,574 feet.

McCulloch County

McClung and others' No. 1 Smith was dry and abandoned at 100 feet. Wagley and others' No. 1 Williamson was a failure at 1,400 feet.

Palo Pinto County

Shaw and others' No. 1 Gilbert was abandoned as a failure at 4,065 feet. McGinley and others' No. 1 Sheppard was also a duster at 1,152 feet.

Shackelford County

Reynolds and others' No. 1 Webb was abandoned at 1,028 feet. So was Sinclair Oil & Gas Co.'s No. 4 Nail, at 4,802 feet.

WICHITA FALLS DISTRICT

Archer County

Allday Oil Corp. and others' No. 1 Herron was dry and abandoned at 1,004 feet. Burton and others' No. 1 Farmer-C made 70 bbls. at 1,524-25½ feet. Consolidated Oil Co.'s No. 1 Bearden was a failure at 1,101 feet. Sun Oil Co.'s No. 2 Andrews was a duster at 1,000 feet. And The Texas Company's No. 1 Wilhelm was likewise a dry hole at 1,502 feet.

Darr and associates' No. 1 Edwards was abandoned as dry at 1,504 feet. So was C. B. Long and others' No. 1 Helm, at 1,604 feet. Same interests' No. 2 Perkins, however, swabbed 110 bbls. at 1,771-76 feet.

Clay County

Ashcroft and others' No. 1 Stine estate was dry and abandoned at 1,772½ feet. O. H. Foster's No. 1 Sanzenbacher was also abandoned at 1,720 feet.

Cooke County

Bell Oil Corp.'s No. 3 Koelzer had oil sand from 1,356 to 1,376 feet but a 150-quart shot went off prematurely and collapsed the casing. The hole was junked, total depth being 1,403 feet. Camp & Hedrick & Oil Operators Trust Co.'s No. 9 Kleiss was good for 35 bbls. after a shot of 15 quarts in broken oil sand at 1,692-1,714 feet. Gray and others abandoned the location for their No. 5 Public Park.

J. W. Hooser's No. 1 Hyman was plugged at 1,803 feet. Miller Drilling Co.'s No. 1 Koelzer was also abandoned at 1,747 feet.

Haskell County

Marland Oil Co. and Texon Oil & Land Co.'s No. 1 Clark was plugging to abandon at 2,503 feet.

Jack County

Buttram Petroleum Co.'s No. 2 Jones estate made 140 bbls. at 2,049-56 feet. Chandler and others' No. 1 Ira Coats was dry and abandoned at 535 feet. Craig, Lowrie & Walton's No. 1 Ira Coats made 15 bbls. at 484-91 feet. Foster & Irwine's No. 1 Ball was a duster at 901 feet. L. M. Lamar's No. 3 Moore was a dry hole at 575 feet.

Madden & Hunt's No. 3 Sloan was esti-

(Continued on Page 175)

TWO NEW FIELDS IN CALIFORNIA; LATE NEWS FROM PRODUCING AREAS

By L. P. Stockman

LOS ANGELES, Calif., Oct. 18.—Two new fields have been opened in California during the past week but neither is expected to cause any alarm as the acreage in each case is all held in large blocks.

The Associated Oil Co. concluded its wildcatting activities in the Potrero area, located midway between the Rosecras and Inglewood Fields by completing No. 1 Cypress as a potential 500-bbl. producer from 4,717 feet on Saturday morn'ng. Production has not yet cleared up but the well made 150 bbls. of 34 gravity oil and 1,000,000 feet of gas with a gasoline content of 2 gallons per 1,000 feet during the past 19 hours. It is flowing through a three-quarters-inch bean under a pressure of 200 pounds on the tubing and 300 pounds on the casing. Flow line tests indicate a cut of 6 per cent mud and sand with no free water present.

Several additional locations have been spotted by other operators but in view of previous unsuccessful work drilling will undoubtedly go ahead slowly until something definite is determined as to how large this new field will be for with several dry holes practically surround'ng the discovery all indications point to a limited productive area with the Associated holding nearly everything through lease holdings and fee owned property.

Potrero is the second field to be opened up in Cal'fornia during the past 10 days as the Barnsdall has just previously got production in a possible new field about 2 miles west of the Goleta Field in Santa Barbara County. It has not been definitely ascertained whether the Barnsdall has an altogether new field or whether it has merely extended the original Goleta Field. It is generally believed, however, that the Barnsdall has a new field.

Seacl'ff and Sulphur Mountain both in Ventura County may also break into the production column at any time as oil is actually present in each area. Geis and Bradford's test on Sulphur Mountain recently produced at the rate of 350 bbls. daily but it is at present hung up with a fishing job. Seacliff also appears almost certain to result in commercial product'on when a satisfactory test is made as the Pan American No. 1 State, located along the ocean front has already cored over 100 feet of oil sand. The effect of these areas on production is problematical as the acreage is all held in large blocks and hence will not be drilled up very quickly.

OKLAHOMA

The Ind'an Territory Illuminating Oil Co.'s No. 4 Nitey, SW SW NE, Section 2-7-6, Little River Pool, Seminole County, Oklahoma, was plugged and abandoned at 4,475 feet.

The Independent Oil & Gas Co.'s No. 1 Wold, C SW SW NE, Section 18-14-10, Creek County, was shot with 10 quarts and increased its production to 588 bb's. the ensuing 24 hours.

In the Allen, Pontotoc County, district, where an occasional good well has been completed this year the Louisiana O.l & Refining Co.'s No. 2 McElroy, SW cor. SE SE, Section 17-5-8, was producing 30 bbls. an hour on air from sand at 2,447-74 feet.

Seminole production for the 24 hours ending Tuesday morning at 7 o'clock was 433,385 bbls., a decline in one day of 9,795 bbls. By pools, the production was Little River, 43,003 bbls.; Bowlegs, 125,184 bbls.; Earlsboro, 170,171 bbls.; Searight, 27,057 bbls.; Sem.nole City,

(Continued on Page 175)

TRAFFIC HEADS OPPOSE HIGHER FREIGHT RATES

The new freight rates from Oklahoma and Kansas to Western Trunk Line po.nts east of the Mississippi River including part of Missouri and Iowa, authorized by the Interstate Commerce Commission in a decision announced last week, will work a special hardship on all refineries operating in the Mid-Continent Field according to a decision reached by 30 traffic managers of Kansas and Oklahoma refineries which held a meeting in Tulsa Tuesday.

After a lengthy discussion of the probable effects of the higher rates which are to become effective January 2, 1928, the traffic managers decided to recommend to company executives that every effort be made to secure the minimum

Map showing new rate grouping of Kansas and Oklahoma refineries in shipments to Western trunk line territory east of the Mississippi River including part of Missouri and Iowa. All of Kansas is included in Group 3 with exception of a small section in southeast Kansas and northeast Oklahoma. No plants are operating in the Northeast Oklahoma area.

rates from the carriers which is possible to obtain under the commission's decision. The rates authorized by the commission are maximum and can be lowered materially by the railroads when they publish their new tariffs. A complete discussion of the commiss.on's decision which was responsible for the Tuesday meeting of traffic managers will be found on page 50 of this issue.

The Oklahoma and Kansas traffic managers also agreed that a more equitable adjustment of freight rates would be obtained if the key points in the consuming terr.tories were located in the center of the destination groups. At present cases these key points are often near the edge of the destination groups. It was pointed out in this connection that the Chicago group rates become effective in Illinois just outside of St. Louis which has substantially lower rates on refined products shipped from Mid-Continent points.

Gray County Sustaining Panhandle

Increase From Bowers Area Wells Offsetting Decline in Hutchinson County. Sensational Output Maintained

By Staff Correspondent

AMARILLO, Tex., Oct. 17.—Continued sensational performance of the Delaney well in the Bowers area of Gray County and the sale of 880 acres in that vicinity for approximately $1,000,000 to the Phillips Petroleum Co. were the chief items of interest in the Texas Panhandle during the past week.

Production declined 275 bbls. in spite of the new Gray County oil which was just barely sufficient to offset natural declines in Hutchinson County. The estimated daily average production for the past week was 89.295 bbls. from 1,375 producing wells. Hutchinson County declined 2,930 bbls. while Gray County increased 2,585 bbls. Carson and Potter Counties registered small gains and Wheeler County a small drop. Following is the production by counties:

County—	Wells	Bbls.
Carson	159	8,280
Gray	168	14,005
Hutchinson	1,006	65,635
Moore	3	0
Potter	1	25
Wheeler	38	1,350
Total	1,375	89,295
Last week	1,371	89,570
Difference	4	275

The sensational well performance referred to was that of Delaney and others' No. 1 W. Jackson, in the NW cor. E half SW of Section 88, Block B-2. This well started making some water last week but the owners thought the water was coming from behind the pipe and it now seems that this is the case. Tuesday, October 11, the well swabbed and agitated 3,300 bbls. A couple of days later it produced 2,500 bbls. with 5 per cent water, although it was off production for 5 or 6 hours due to the fact that all available storage was full. Sunday the water had decreased to 1 per cent and the gauge showed 4,008 bbls. of oil. Total depth of this test is 2,985 feet.

Gibson Oil Corp.'s No. 1 Bowers in Section 92, Block B-2, about three-quarters of a mile northwest of the Delaney well, averaged 935 bbls. daily for a week at total depth of 3,130 feet and was completed.

Danciger Oil & Refining Co.'s No. 1 W. Jackson, in the NW cor. of Section 88, which flowed 560 bbls. October 12 while cleaning out 20 feet off bottom, total depth 3,080 feet, was reported Monday to be drilling ahead slowly and flowing 40 bbls. an hour.

In the Le Fors townsite, the test being drilled by the company of that name, has picked up 70,000,000 feet of gas at 2,620 feet.

Panhandle Wildcats

Panhandle wildcats, as a whole, have been discouraging during the past few weeks. Several have picked up good-looking oil and gas shows, but they have not panned out.

In Moore County, A. O. Duggan's No. 1 John Lowery, located in Section 237, Block 44, Dumas townsite, found some oil at 3,605 feet last week but after casing was set at 3,604 feet and drilling was resumed, hard lime was encountered from 3,620 to 3,657 feet and there some water was found. At latest report the well was shut down.

In Sherman County, Marland Oil Co., Hagy & Harrington are plugging their No. 1 Flores, total depth being 4,003 feet.

In Dallam County, Wood & Wood's No. 1 Capitol Syndicate in the NE cor. of Section 19, Block 17, C. S. & S. Survey, was shut down at 4,000 feet, contract depth, without any encouraging grease. The surface elevation of this test is 4,440 feet, and it may be drilled deeper.

In Armstrong County, Frank Meadows, Jr., and others' No. 1 E. D. Harrell, located in the center of Section 100, Block A-5, A. & G. Survey, was shut down at 4,632 feet after encountering 900 feet of sulphur water at 4,605 feet. The surface elevation of this well is 3,226 feet.

Oldham County's hope, the Prairie Oil & Gas Co.'s No. 1 Landergin, in Section 46, League 310, also failed to make a commercial producer out of its much-heralded deep showing. At latest report it was drilling in black shale at 4,745 feet. The oil showing was found about the middle of September at 4,495-4 515 feet, with a surface elevation of 3,606 feet. The big lime in this well was topped at 3,770 feet or 164 feet below sea level.

The Empire Gas & Fuel Co. has 130 miles of its line to Kansas City completed. During the past week the Lone Star Gas Co. tied in its gas line from Wheeler County to Dallas, Tex.

New Locations

Nine new locations were announced this week in the Texas Panhandle. Gray County led with five, of which number three are in the Bowers area which bids strongly for current honors as the Panhandle's best potential pool. The locations follow:

Gray County

Skelly Oil Co.'s No. 1 W. Jackson, NW cor. SE, Section 88, Block B-2, H. & G. N. Survey, building rig. Delaney and others' No. 2 Jackson, NE cor. SW, Section 88, same block. Danciger Oil & Refining Co.'s No. 4 Jackson, SE cor. NW, same section. (This company has combined all of the northwest quarter of Section 88 into one lease, thereby changing the numbers of its No. 1-A and 2-A to Nos. 2 and 3 respectively. Formerly, the south half of the NW was carried as its "A" lease.)

Remo Oil Co.'s No. 1 B. E. McKinney, 330 feet out of the SW cor. Section 163, Block 3, I. & G. N. Survey. Camel and others' No. 1 B. E. McKinney, 1,980 feet from the west line and 800 feet from the south line of Section 163, Block 3, rig on the ground.

Hale County

Tolbert & Simms' (formerly Gouldy and others') No. 1 Kitteral, 500 feet from the east line and south line of NW Section 65, Block A-3, L. & S. V. Survey. This is a corrected location.

Hutchinson County

Timms and others' No. 1 C. R. Garner, NE cor. E half SE Section 124, Block 4, I. & G. N. Survey. Prairie Oil & Gas Co. and Vacuum Oil Co.'s No. 2 Cal Merchant, 7,494 feet from the north line and 290 feet from the east line of Section 37, Block 47, H. & T. C. Survey (one location north of No. 1 Cal Merchant.)

Floyd County

Hoffer Oil Corp.'s No. 1 Nelson, 2 640 feet from the north line and 330 feet from west line of east half Section 34, G. W. T. & P. Survey.

TEXAS PANHANDLE COMPLETIONS

Gray County

Empire Gas & Fuel Co.'s No. 1 I. B. Hughey in Section 129, Block 3, has installed gas lift and averaged 34 bbls. daily for the past week. Its total depth is 3,225 feet, completed.

Gibson Oil Corp.'s No. 1 J. B. Bowers, Section 92, Block B-2, which flowed 1.340 bbls. initial from granite wash at 2,965-3,007 feet and 3,104-22 feet, averaged 935 bbls. daily for a week and has been completed. Gas lift is being installed at this well.

Riley & Heck's No. 1 J. A. Hopkins, in Section 66, Block B-2, has been temporarily abandoned at 3,305 feet. The tools have been removed but the hole has not been plugged.

Wilcox and others' No. 2 Combs & Worley in Section 40, Block 3, swabbed 140 bbls. from lime at 2,975-3.050 feet and from granite wash at 3,105-25 feet. It averaged 85 bbls. for a week, was shot with 400 quarts from 2,906-3,100 feet, bridged and is cleaning out.

Childress County

Hoover and others' No. 1 O. L. Tucker in Section 736, Haggard Survey, was temporarily abandoned. It had been shut down for some time after spudding.

Hartley County

J. E. McKanna's No. 1 Frances Farwell, in Section 30, Block 22, was abandoned as dry at 3,500 feet. Same interests' No. 1 J. M. Shelton in Section 29, Block 202, was also abandoned at 3,385 feet. It has an elevation of 3,726 feet.

Hutchinson County

Prairie Oil & Gas Co.'s and Vacuum Oil Co.'s No. 1 Cal Merchant, along the east line of Section 37, Block 47, was completed for 78,000,000 feet of gas at 2,495-2,540 feet. Ralph & Baker's No. 1 Smith, in Section 10, Block Y, made 25 bbls. at 2,700-2,805 feet and was shut in for storage.

Swisher County

Exploration Co.'s No. 1 W. C. Dinwiddie, Section 70, Block M-11, A. B. & M. Survey, was temporarily abandoned with the rig on the ground.

Wheeler County

The Texas Company's No. 1 G. Bell, Section 71, Block 13, H. & G. N. Survey, pumped 120 bbls. at 2,145-55 feet, total depth 2,740 feet, plugged back to 2,165 feet.

TEXAS PANHANDLE

Production of Major Companies for Week Ending October 15, 1927

Hutchinson County

Company—	Wells	Bbls.	Aver.
Amerada Pet. Corp.	10	409	40.9
Derby Oil Co.	11	560	51.0
Dixon Creek Oil Co.	43	3,375	78.4
Empire Gas & Fuel Co.	26	800	30.7
Gulf Prod. Co.	98	6,655	67.0
Hughes, J. K., Dev. Co.	22	738	33.5
Marland Oil Co.	56	1,738	31.0
McMan O. & G. Co.	25	878	35.1
Midwest Expl. Co.	25	2,253	90.1
Pantex Oil Co.	9	639	71.0
Phillips Pet. Co.	241	19,863	80.7
Prairie O. & G. and Phillips Pet.	73	3,182	43.5
Prairie O. & G. Co.	9	216	24.0
Prairie et al	9	963	107.0
Pure Oil Co.	5	587	117.4
Roxana Pet. Corp.	11	2,936	266.9
Skelly Oil Co.	29	1,026	35.3
The Texas Company	2	388	194.0
White Eagle O. & R. Co.	24	971	40.4
Total	727	49,177	
All other companies	279	16,458	
Grand totals	1,006	65,635	

Carson County

Empire G. & F. Co.	8	700	87.5
Gulf Prod. Co.	21	361	17.2
Magnolia Pet. Co.	3	353	117.0
Marland Oil Co.	23	874	38.0
McMan O. & G. Co.	11	493	44.8
Prairie O. & G. Co.	10	1,151	115.1
Roxana Pet. Corp.	15	862	57.4
Skelly Oil Co.	10	1,474	147.4
The Texas Company	18	444	24.6
Total	121	6,712	
All other companies	38	1,568	
Grand total	159	8,280	

Gray County

Empire G. & F. Co.	8	462	57.7
Gulf Prod. Co.	16	2,180	132.5
Humble O. & R. Co.	13	559	43.0
Magnolia Pet. Co.	22	776	35.2
McMan O. & G. Co.	10	402	40.2
Marland Oil Co.	1	28	28.0
Midwest Explo. Co.	1	75	75.0
Phillips Pet. Co.	7	430	61.4
Prairie O. & G. Co. et al	19	1,343	70.6
Pure Oil Co.	9	357	39.6
Roxana Pet. Corp.	5	478	95.6
The Texas Company	8	290	37.5
Wilcox-Pampa Oil Co.	29	1,941	60.0
Total	148	9,120	
All other companies	20	4,885	
Grand total	168	14,005	

WILDCAT OPERATIONS IN PANHANDLE

Week Ending October 15, 1927

ARMSTRONG COUNTY

Company, Well, Farm Name, Section and Block— Remarks—

Meadows et al's No. 1 E. D. Harrell, C Sec. 100, Blk. A-5, A. & G. Sur. — S.D., 4,630 ft; 900 ft. wtr, 4,605 ft.

United Oil & Trust Co.'s No. 1 J. P. Reck, Sec. 102, Blk. 4, H. & G. N. Sur. — Spudded and temp. abd., 298 ft.

BAILEY COUNTY

Gibson Oil Co. et al's No. 1 Webb Miller, NE cor. Sec. 15, League 186, Swisher County School Land — Rigging up.

Humble Oil & Refining Co.'s No. 1 W. H. Fuqua, cen. E. half Sec. 117, Blk. A, Melvin, Blum & Blum, Sur. — Drlg., 870 ft.

BRISCOE COUNTY

C. S. Rice's No. 1 J. C. Anderson, SE cor. NW NW, Sec. 22, Blk. B-8, B. S. & F. Sur. — S D., 1,620 ft.

CARSON COUNTY

Amatex Dev. Co.'s No. 1 E. S. Polling, Sec. 22, Blk. 2-Y — S.D., 2,110 ft.

Empire G. & F. Co.'s No. 4 Burnett estate, C NW, Sec. 45, Blk. 5, I. & G. N. Sur. — Drlg., 820 ft.

Empire G. & F. Co.'s No. 5 Burnett estate, C NE, Sec. 63, Blk. 5, I. & G. N. Sur. — Drlg., 1,050 ft.

Empire G. & F. Co.'s No. 6 Burnett estate, C NE, Sec. 62, Blk. 5, I. & G. N. Sur. — Drlg., 260 ft.

Empire G. & F. Co.'s No. 8 Burnett estate — Rigging up.

Magnolia Pet. Co.'s No. 5 fee 244 — Drlg., 2,120 ft.

The Texas Company's No. 1 J. C. McConnell-B — Drlg., 2,245 ft.

Marston Oil Co.'s No. 1 J. L. Noel — S.D., 3,064 ft.

Navajo Oil Co.'s No. 1 E. S. Polling, Sec. 22, Blk. 2-Y — Set 6-in., 2,496 ft; S.D., 2,712 ft.

Panhandle Northern Oil Co., Sec. 63, Blk. 3, T. T. R. R. Sur. — Cellar.

Stubblefield et al's No. 1 E. Cooper, SW cor. NE Sec. 5, Blk. 9, I. & G. N. Sur. — Small show oil, 3,019 ft; 1,500 ft. oil in hole; 3,091-3,116 ft; will run 5-in. with packer.

Vitek Oil Co.'s No. 1 J. H. Eller, NE cor. NW Sec. 200, Blk. 3 — S.D., 900 ft.

Willis et al's No. 1 Burnett estate, C SE SW NW, Sec. 111, Blk. 5 — Rotary drlg., 2,135 ft.

CASTRO COUNTY

Colorado O. & R. Co.'s No. 1 M. Slemmons, SW cor. Sec. 78, Blk. M-17, B. S. & F. Sur. — Rig blown down.

Mystery Oil Co.'s No. 1 J. I. Crum, SE cor. NE Sec. 333, Blk. M-6, S. K. & K. Sur. — S.D., 510 ft. for casing.

CHILDRESS COUNTY

Brookins et al's No. 1 Mrs. Givens, 600 ft N and W of SE cor. Sec. 676, W. & M. W. Sur. — Spudded and S.D.

Continental Oil Co.'s No. 1 B. P. Smith, C NE, Sec. 14, Blk. 9 — One baller wtr. per hr., 2,450 ft; drlg., 2,890 ft.

Hoover & Calloway's No. 1 O. L. Tucker, Sec. 736, Haggard Sur. — Spudded and S.D.

C. L. Sloane et al's No. 1 B. P. Smith, Sur. 49, F. P. Knott lands — Set 6-in. pipe at 2,903 ft; S.D., 3,000 ft.

(Continued on Page 152)

VETERAN GAUGER DIES

OIL CITY, Pa., Oct. 15.—Matthias Hafele died at his home in Emlenton in his eighty-third year. Mr. Hafele moved to Foxburg in 1872, where he entered the employ of the Mutual Oil Co., later known as the National Transit Co. He moved to Emlenton in 1896, working as gauger for the National Transit Co. for 32 years, retiring in 1904.

DUNN TOOLAGRAM
These Tongs are 100% Successful with Automatic Catheads
OIL WELL DUNN TOOLS
TRADE MARK REG.
Make Us Prove This!
Let us send you any size or type of Dunn Safety Casing or Rotary Tongs, prepaid. If it does not prove to be 100% successful, safe, fast and all-round satisfactory for use with any type of automatic cathead, either with or without a "pull-back" or counterbalance line, send it back to us at our expense. No questions asked. Let the tong prove itself.
DUNN MANUFACTURING COMPANY
OXNARD, CALIFORNIA
Mid-Continent Branch Warehouse
215 East Archer St. Tulsa, Oklahoma
Export Sales Office
150 Broadway, New York City
DUNN SAFETY means DONE SAFELY

Announce Additional Rate Increases

Latest I. C. C. Decision Enlarges Scope of Advances From Mid-Continent. Central Kansas and Oklahoma in Same Group

By C. O. Willson

A further increase in the freight rate on gasoline and other refined products for a majority of the Mid-Continent refiners will become effective the first of next year based on a decision announced during the past week by the Interstate Commerce Commission. The latest decision of the commission establishes the rate structure for that part of the Western Trunk Line consuming territory from Mid-Continent refining centers not covered finally in previous decisions.

The new rates which will become effective January 2, 1928, will apply to that part of the Western Trunk Line territory consisting of Illinois, southeastern Wisconsin, including Milwaukee and parts of Iowa and Missouri. The rates as prescribed in the commission's decision are maximum. Some reductions can be made by the interested carriers if they so desire. The regroupings in the original territories and the differentials prescribed, however, cannot be changed. It is assumed that the next effort of the Mid-Continent refiners will be to secure as low rates as are possible under the commission's decision.

Proposed New Rates

The new rates will be based on the following table, which is taken from the commission's decision:

To—	From Group 3*	Differentials Under Group 3 From Group 1	From Group 2†
St. Louis, Mo.	31.5	3	2
Keokuk, Iowa	33	..	2
Peoria, Ill.	35.5	..	2
Davenport, Iowa	35.5	7	2
Chicago, Ill.	38.5	..	2
Milwaukee, Wis.	41.5	..	2

Rates or Differences in Rates in Cents per 100 Pounds

*Points in Kansas and Oklahoma distant more than 385 miles from St. Louis, Mo., over short-line routes via junctions at which carriers maintain physical track connections for the interchange of freight traffic.

†Points in Kansas, Oklahoma and southwestern Missouri 385 miles and less from St. Louis, Mo., over short-line routes via junctions at which carriers maintain physical track connections for the interchange of freight traffic.

In connection with this order attention is called to the accompanying Table 1 which shows the present and proposed rates to representative points in the destination territory. The commission did not establish definitely the rates which are to become effective at points intermediate to the river crossings. In regard to what the policy of the railroads shall be in establishing these rates the commission stated: "The rates or bases of rates found reasonable are to representative destinations. The rates to other destinations within the territory here dealt with, including the territory intermediate to the river crossings, should be adjusted in proper relationship thereto. The findings in our original report are modified accordingly. Although we have changed somewhat the area of Group 3, we shall expect the carriers, in establishing rates pursuant to the above findings, to observe the relationships to that group which were prescribed in our original report and order from groups other than those herein specifically dealt with."

Thus the rates to certain Iowa and Missouri intermediate points probably will not be known until the carriers' tariffs are published previous to the date on which the changes are authorized to become effective.

New Grouping

The outstanding feature of the commission's decision outside of the higher rates authorized as interpreted by the representative Mid-Continent refiners lies in the change made in the origin groups. The decision in effect means that in shipments to the territory just outlined, Group 3 instead of being confined exclusively to Oklahoma, will include all of Kansas except a small group of refineries located in the southeast part of the state. This latter group will be known as Group 2, a freight grouping which in the past has included all of Kansas. It should be made clear in this connection that this change in groupings applies only to shipments of gasoline and other refined products from Oklahoma and Kansas points to Illinois, southeast Wisconsin and parts of Iowa and Missouri yet to be determined. To other destination areas the groupings and rate structure has not been disturbed in the latest I. C. C. decision.

History of Case

In order to have a clear idea of the scope of the commission's decision of last week it is first necessary to know something of the issues involved in previous decisions affecting the Mid-Continent rate structure. The latest decision is the result of a controversy which had its beginnings early in 1924. At that time it will be recalled Kansas City refiners (Group 1) and Kansas refiners (Group 2) in dockets 15,584 and 15,585, sought to have their freight rate differentials under Oklahoma (Group 3) to western trunk line territory increased through the lowering of their rates. The western trunk line territory consists of Nebraska, South Dakota, North Dakota, Minnesota, Iowa, Wisconsin, the northern Peninsula of Michigan, north and west of a line drawn from Chicago down through Joliet, LaSalle and Peoria and following the Illinois River down to a point north of Alton. The territory also includes the northern part of Missouri, north of line drawn from St. Louis northwesterly to Kansas City.

The filing of these two petitions precipitated a controversy in which practically every refinery group in the Southwest and Midd'e West became interested either as complainants or intervenors. Extended hearings were held during the following year. A group of northeastern Oklahoma refiners sought to have a new regrouping made as did the North Texas refiners. The defendant railroads also sought a regrouping with generally higher rates.

First Decision

The issues involved were bitterly contested and the fight was continued by certain groups even after the commission finally in July, 1926, announced its first decision in the case. This decision failed to find favor with any of the interested parties. The Group 2 refiners secured a 2-cent differential under Group 3 refiners but this was obtained by advancing the latter's rates rather than lowering their own.

The enforcement of the commission's decision was postponed from time to time but it finally became effective in part July 20 of this year. In the meanwhile the Northeast Oklahoma refiners had been especially active in seeking to have the case reopened.

They were successful to the extent that on May 11 of this year the commission reopened the proceedings for further hearing with respect to the rates on products taking the same rates from all of the origin territory to St. Louis and to destinations east of the Mississippi River to which short routes from Tulsa make through Mississippi River crossings, Davenport, Iowa, and south. The date of the original order so far as this territory was concerned was postponed until November 20, 1927. This covered the destination territory of Illinois and southeast Wisconsin. Later on September 7, 1927, the commission reopened the case as it applied to the intermediate territory traversed in the order of May 11. This includes a small part of Iowa and the greater part of Missouri.

The commission heard additional testimony concerned with that part of the case which was reopened. In the meanwhile on July 20 the new rates became effective in the remainder of the western trunk line territory under the decision of July, 1926. These new tariffs in general brought higher rates to a majority of the Mid-Continent refiners of particular importance to Oklahoma and North Texas refiners to destination points west of the Mississippi River.

Northeast Oklahoma Refiners

The case so far as the destination points east of the Mississippi River was reopened largely through the efforts of a group of northeastern Oklahoma refiners. These refiners were joined by most of the southwestern carriers who reversed their original attitude after the commission's decision was announced taking the position that the higher rates would work a special hardship on the Oklahoma refiners. The main contention of the northeast Oklahoma refiners was to the effect that they were entitled to equal rates with Kansas refiners in western trunk line territory to points east of the Mississippi River. They sought to obtain this equality by having the rates lowered as established in the July, 1926, decision.

Rates Higher

Through the regrouping made effective by the commission's decision of last week the contention of the northeast Oklahoma refiners in regard to equality with Kansas refiners was in part substantiated. Central Kansas, which has the bulk of the state's refinery capacity, was made a part of Group 3 as previously explained. However the commission refused to include the southeast Kansas refineries and one at Joplin, Mo., and also refused to separate the northeast Oklahoma group from the remainder of Oklahoma as a basis for rate making.

The southeast Kansas and Missouri area which will constitute Group 2 has the following operating refineries: Sinclair Refining Co. and National Refining Co., Coffeyville, Kans.; Standard Oil Co. of Kansas at Neodesha, Kans.; Peerless Refining Co., Chanute, Kans., and Wilhoit Refining Co. at Joplin, Mo. These refineries on October 1 were refining 26,600 bbls. of crude oil daily, according to the monthly report of The Oil and Gas Journal. The total for all of the Kansas refineries—16 in number—on that date was 84,100 bbls. daily. The 43 operating refineries in Oklahoma on the same date were refining 185 655 bbls. daily.

Helps Middle West

As the situation now stands all the rate changes made during the past two years have added to the transportation advantage of the refineries located in the consuming territory of the Middle West—notably St. Louis and Chicago plants—at the expense of the Mid-Continent groups (Oklahoma, Kansas, North Texas, North Louisiana and Arkansas). This situation has developed despite the fact that the cases which brought about the decisions were originated by Mid-Continent refiners who were hoping to better their competitive position from a transportation standpoint.

On the basis of the decisions up to this time that the Oklahoma refiners have been hardest hit. Some of the other groups as shown in Table 1 face as large increases as the Oklahoma refiners to the western trunk line points. However, in most cases these refinery groups have lower rates than Oklahoma to near-by consuming territories where they can dispose of all or part of their plant output.

In this connection the latest decision of the Interstate Commerce Commission is of more importance to the Oklahoma refiners than it is to the Kansas operators. The Kansas refiners still have their 2-cent differential advantage over Oklahoma refiners to the western trunk line territory west of the Mississippi. Most of their output goes to that territory at the present time. Should the higher rates become effective east of the Mississippi River it is probable that this percentage will be increased. Oklahoma refiners on the other hand do not have any outside territory where they can ship without absorbing freight rate advantage of some adjoining refining group. This situation is the basis for the statement often heard recently that the Oklahoma refining industry will diminish in importance, the larger companies being forced to locate their plants at points more advantageous from the standpoint of freight rates.

Reason for Change

In regard to its reason for placing Central Kansas and Oklahoma (Group 3) in the same destination group to points east of the Mississippi, including intermediate points, the commission stated:

"Upon further consideraton and in light of the additional evidence presented, we are of the opinion that the keenly competitive situation as between the refiners in northern Oklahoma and those in central Kansas, and the approximately equal average distances from these two districts, warrant a parity of rates therefrom to the destination territory here under consideration. It remains to be determined what, if any, other changes in our former findings should be made."

The last sentence of this statement is considered significant as pointing to other possible changes in present rates at a later date. In this connection some observers fear that the raising of rates of southwestern railroads points to higher rates for Mid-Continent refiners in the remaining territory east of the Mississippi. This issue, which involves rates to Indiana, Ohio and other eastern points, is now pending in a case before the Interstate Commerce Commission. The relative rates in the southwest and eastern areas was brought into the case just decided. Relative to this matter the commission said:

"The central territory lines operating

(Continued on Page 151)

TABLE 1—Showing rates now in effect from Groups 1, 2 and 3 to representative points east of the Mississippi River in western trunk line territory and the new rates which will become effective January 2, 1928.

	Kansas City Group 1		New Kansas Group 2		Kans.-Okla. Group 3		Ranger Group		Shreveport-El Dorado		South Texas		San Antonio Group		North Texas	
	Present	New	Present	New	Present	New	Present	New	Present	New	Present	New	Present	New	Present	New
St. Louis	28.5	23.5	30.0	29.5	30.0	31.5	35.0	35.5	30.0	31.5	32.5	34.5	35.0	36.0	32.5	34.0
Keokuk	26.5	26.0	31.0	31.0	31.0	33.0	36.0	37.0	31.0	33.0	33.5	36.0	36.0	37.5	33.5	35.5
Peoria	29.5	28.5	33.0	33.5	33.0	35.5	38.0	39.5	33.0	35.5	35.5	38.5	38.0	40.0	35.5	38.0
Davenport	26.5	28.5	33.0	35.5	33.0	35.5	38.0	39.5	33.0	35.5	35.5	38.5	38.0	40.0	35.5	38.0
Chicago	32.5	31.5	36.0	36.5	36.0	38.5	41.0	42.5	36.0	38.5	38.5	41.5	41.0	43.0	38.5	41.0
Milwaukee	36.0	34.5	39.5	39.5	39.5	41.5	44.5	46.5	39.5	41.5	42.0	44.5	44.5	46.0	42.0	44.0

"If Federal or additional State legislation is essential as a corrective, the sooner such enactment is evolved the better.

"If the remedy rests with the oil companies themselves, through voluntary and wholehearted co-operation, or through compulsory unit pool operation, or some other method, the time is pre-eminently ripe for action."

Extract from the speech of Hon. Hubert Work Secretary of the Interior and Chairman of the Federal Oil Conservation Board, before the Mineral Law Section, American Bar Association, at Buffalo, August 30, 1927

Universal Oil Products Company
Owner of the Dubbs Process
310 South Michigan Ave
Chicago, Illinois

Seminole Field Just Holding Its Own

Air Lift Makes Big Wells Out of Two Completions, but Salt Water Showings Numerous. Quiet Week Elsewhere

By J. L. Dwyer
Staff Correspondent, Oklahoma Fields

The production of the Seminole Field for the 24 hours ending Monday at 7 a. m. was 443,180 bbls. divided as follows: Seminole City, 327 wells, 69,102 bbls.; Earlsboro, 223 wells, 170,817 bbls.; Bowlegs, 258 wells, 130,025 bbls.; Searight, 60 wells, 27,298 bbls.; Little River, 37 wells, 45,938 bbls., a grand total of 904 wells and an average daily production per well of 490 bbls. One week previous there were 884 wells and 436,840 bbls. production, showing an increase of 20 wells and 6,340 bbls. in production.

There were a few new large producers in the course of the week but they were all made so by the use of the air lift. Water showings in numerous wells were disconcerting, especially where they perhaps outlined the limits of a pool, as two of the Gypsy Oil Co.'s wells did in the east side of Little River.

Outside of the Seminole area there was little of consequence in the way of results in the State.

Not until the new year, or later in January, will the industry be able to get any line on the Logan County territory, where the Roxana Petroleum Corp. completed a good well in the Wilcox sand at a total depth of 5,985 feet in Section 30-19 4w, which is still flowing over 2,000 bbls. a day. There are four wells below 4,500 feet, two of the Roxana corporation in Section 29, and another of the same corporation in Section 30. Lou Wentz is drilling below 4,500 feet in Section 31. Notwithstanding, these wells are already below the level of the Wilcox sand in the Seminole area, they have over 1,400 feet of hole to make before reaching the Wilcox level in Logan County, and drilling at that depth is slow.

In the Little River Pool

There are 88 wells drilling in the Little River Pool in Townships 7-6 and 8-6, Seminole County. Of this number 42 have set pipe and should be completed by November 5. There were 35 wells producing at the close of the calendar week of which 21 were producing by means of the air-gas lift. The Blackwell Oil & Gas Co.'s No. 4 Nitey, NE SE SE, Section 33-8-6, got the Wilcox sand at 4,251-55 feet and the hole filled up 1,500 feet with oil and 800 feet with water. It is in the heart of the pool with oil wells all around it producing from the Wilcox sand, but this well found production only in the Simpson formation, just above the Wilcox. The water is from the Wilcox sand. The Indian Territory Illuminating Oil Co.'s No. 4 Nitey, C SW SW SE, Section 2-7-6, was drilling at 4,462 feet with a hole full of water. The Mid-Continent Petroleum Corp.'s No. 7 Wadsworth, C NE SE SW, Section 36-8-6, made 480 bbls. in nine hours from the Wilcox sand at 4,285-86 feet. The Tidal Oil Co.'s No. 1 House, C NE NW NW, Section 1-7-6, swabbed 480 bbls. in 12 hours from sand at 4,107-13 feet. The Philmack Oil Co. and the White Eagle Oil & Refining Co.'s No. 1 Davis, C NE SW SE, Section 2-7-6, swabbed 35 bbls. an hour from sand at 4,375-80 feet. The Blackwell Oil & Gas Co.'s No. 6 Nitey, C SW NE SE, Section 35-8-6, made 195 bbls. the first 24 hours and will be put on air. Nos. 1, 2, 3 and 5, on this property, are already on air.

The Gypsy Oil Co.'s No. 1 Nungee, C NW NE NE, Section 1-7-6, was making 60 bbls. of oil and some water from sand at 4,278-90 feet. The Gypsy Oil Co.'s No. 2 Campbell, C NW SE, Section 36-8-6, got the Wilcox sand at 4,290-93 feet and filled up 3,500 feet with oil. The Mid-Continent Petroleum Corp.'s No. 7 Wadsworth, C NE SE SW, Section 36-8-6, made 990 bbls. on the swab and will be put on air. The Gypsy Oil Co.'s No. 1 Wadsworth, C NW NW SE, Section 1-7-6, has salt water in the upper Wilcox sand topped at 4,250 feet. It will be drilled down to the lower Wilcox, but like No. 1 Nungee in the same section it looks like a failure. The two wells are on the east edge of the Little River Pool.

The Continental Oil Co.'s No. 2 Cosar, C SW SE NW, Section 36-8-6, swabbed 1,329 bbls. in 24 hours from the Wilcox sand at 4,198-4,212 feet. Gypsy Oil Co.'s No. 2 Campbell, C NW NW SE, Section 36-8-6, swabbed 585 bbls. in 24 hours from sand at 4,290 95 feet and is being tubed for air. The Mid-Continent Petroleum Corp.'s No. 8 Wadsworth, C SE SE SW, Section 36-8-6, swabbed 400 bbls. in 18 hours from sand at 4,337 feet. Blackwell Oil & Gas Co.'s No. 8 Nitey, C NE NE SE, Section 35-8-6, swabbed 1,453 bbls. in 24 hours from sand at 4,371-76 feet. Indian Territory Illuminating Oil Co.'s No. 3 Dungan, C SW SW SE, Section 35-8 6, swabbed 323 bbls. in 15 hours from sand at 4,115-17 feet. Carter Oil Co.'s No. 1 Fisher, C SW NW SW, Section 36-8-6, swabbed 600 bbls. in 10 hours from sand at 4,125-30 feet. Roxana Petroleum Corp.'s No. 1 Jimsey, C SW NE NE, Section 1-7-6, got Wilcox sand at 4,248 feet and at 1 foot in it swabbed 40 bbls. of oil and two bailers of water per hour. Indian Territory Illuminating Oil Co.'s No. 2 Jackson, C SW SW NW, Section 1-7-6, had 1,000 feet of oil in the hole from Wilcox sand at 4,161-67 feet.

Earlsboro Pool

In the Earlsboro Pool, Township 9-5, Seminole County, the Continental Oil Co.'s No. 1 Bruner, C SE SW SW Section 2-9-5, got Wilcox sand at 4,470-85 feet and made 240 bbls. in 10 hours on air. The Empire Gas & Fuel Co.'s No. 5 Edmundson, C NE SE SW Section 3-9-5, found Wilcox sand at 4,370 feet and was drilling at 4,408 feet with 1,500 feet of oil and water in the hole. Shaffer Oil & Refining Co.'s No. 1 Clark, C SW SE SE Section 1-9-5, was drilled 4 feet deeper and into salt water. Some company's No. 5 Clark, C SE SW SE Section 1-9-5, had a hole full of water in the Misener sand at 4,208-16 feet. The Twin States Oil Co.'s No. 3 Hearn, C NE NE SE Section 2-9-5 had a 70-bbl. a day showing in the Cromwell sand at 3,815-16 feet. The Texas Company's Wilmont, C SE NE SE Section 10-9-5, got Wilcox sand at 4,307 feet and drilled to 4,313 feet. The well made 610 bbls. in ¾ hours. The Prairie Oil & Gas Co.'s No. 10 Stidham, C NE SW NE Section 11-9-5, swabbed 200 bbls. in 20 hours on air, 40 per cent cut, from Wilcox sand at 4,322-38 feet.

The Gypsy Oil Co.'s No. 3 Sango has extended the Earlsboro Pool a quarter mile northeast and a half mile east. It is located in the C SW SE NE Section 1-9-5. Wilcox sand was found at 4,315 feet, total depth 4,340 feet and the hole is full of oil. The Gypsy Oil Co.'s No. 4 Carter, C NW NE NW Section 11-9-5, got Wilcox sand around 4,290 feet and is good for 100 bbls. a day on the swab.

Barnsdall Oil Co.'s No. 3 Ingram, C SW SW SW Section 1-9-5, swabbed 132 bbls. with a show of water from Wilcox sand at 4,304-16 feet. Same company's No. 5, C NE SW SW Section 1-9-5, flowed 1,373 bbls. in 24 hours after agitating, from sand at 4,329-42 feet. The Shaffer Oil & Refining Co.'s No. 3 Clark, C SE SE SW Section 1-9-5, got Wilcox sand at 4,326-30 feet and has 1,500 feet of water and a showing of oil in the hole. Its No. 4 Clark, C SW SW SE Section 1-9-5, got Wilcox sand at 4,484-86 feet and has 1,500 feet of oil in the hole. Tidal Oil Co.'s No. 8 Watkins, C SW NE NW Section 9-9-5, had 200 feet of oil in the hole from sand at 4,480 94 feet. The Texas Company's No. 4 Brown, C NE SE NW Section 10-9-5, made 720 bbls. in 24 hours on air, sand at 4,388-98 feet. The Independent Oil & Gas Co.'s No. 3 Gaines, C NW NE NE Section 11-9-5, got Wilcox sand at 4,279 feet but was drilling at 4,495 feet with the hole full of water. The Prairie Oil & Gas Co.'s No. 8 Stidham, C SE NW NE Section 11-9-5, found Wilcox sand at 4,555 feet and at 2 feet in flowed 130 bbls. It will be put on air. No. 11 Stidham, C NW SW NE Section 11-9-5, flowed 195 bbls. in 24 hours from sand at 4,308-14 feet. Continental Oil Co.'s No. 1 Hollins, C SE SE NW Section 12-9-5, is a 3,000-bbl. well on air. The sand lies at 4,280 feet, to the total depth 4,307 feet. The Magnolia Petroleum Co.'s No. 1 Sullivan, C NW NW NW Section 12-9-5, got Wilcox sand at 4,268-4,303 feet. The well made 4,146 bbls. the first 24 hours it was on their air lift.

In the Bowlegs area there was not so much in the way of results as in Little River and Earlsboro. The Twin State Oil Co.'s No. 2 Jones, C NW NE SE Section 11-8-6, made 15 bbls. in 24 hours on air from sand at 4,116-34 feet. The Roxana Petroleum Corp.'s No. 7 Taylor, C NE NW NE Section 16-8-6, has sand at 4,362-65 feet (total depth) and 1,200 feet of water and 150 feet of oil in the hole.

SEMINOLE PRODUCTION

Production of the Greater Seminole area on October 14 was as follows:

Company, Farm—	Wells	Prod.
Little River		
Amerada:		
Fore	1	895
Blackwell:		
Nitey	6	5,855
Gypsy:		
Campbell	1	1,405
Hungee	1	120
Potty	1	947
Indian Territory:		
Dungan	2	3,218
House, M. A.	1	2,958
House, W. E. "A"	1	1,512
House, W. E. "B"	1	2,130
Jackson	2	4,223
Nitey	3	7,393
Reed	1	1,857
Soketneche	1	344
Mid-Continent:		
Wadsworth	4	2,660
Philmack:		
Reed	1	400
Prairie:		
Dugan	1	1,460
House	1	652
Superior:		
Wadsworth	1	139
Tidal:		
House	2	50
Johnson	1	300
Total	32	38,518
Earlsboro		
Amerada:		
Anderson	4	2,970
Cowden	6	2,295
Rodgers	2	3,535
Barnsdall:		
Brown	3	2,604
Bruner, F.	1	....
Bruner, N.	3	5,465
Cudjo, C.	1	21
Davis, D.	3	2,075
Davis, J.	2	535
Davis, M.	3	1,852
Gibson	6	1,767
Hearn	1	16
Ingram	2	1,842
Pack	4	1,052
Peter	4	506
Sango	1	107
Sebolka	1	2,108
Smith	1	....
Sullivan, H.	2	1,356
Sullivan, Harjo	3	127
Wasutke	3	3,620
Carter:		
Davis	1	790
Payne	2	1,500
Sango	2	1,835
Continental:		
Bruner	..	....
Spencer	4	9,985
Crosbie:		
Bryant	2	2,687
Empire:		
Barker	1	....
Edmundson	3	3,591
Gypsy:		
Hunick	1	442
Bruner	4	4,335
Carter	6	3,460
Earl	1	2
McFarland	1	....
Noble	3	13,457
Peter	5	1,490
Sango	1	....
State	4	342
Strain	1	....
Independent:		
Bruner	4	4,842
Sullivan	4	646
Knapp	4	2,226
Gaines	3	8,275
O'Dell	4	2,224
Inter-Ocean:		
Payne	1	....
Magnolia:		
Bryant	4	1,915
Cowden	2	510
Dixon	2	64

MORE DRY HOLES IN CEDAR CREEK LIMIT THE POOL TO SMALL AREA

By Special Correspondent

MEXIA, Tex., Oct. 17.—While drilling for gas on the Garrett property 8 miles northwest of Kosse, Limestone County, the Noah Pierce Oil & Gas Co. drilled into an oil showing in a sand at 865 feet. It will be tested. The company is under contract with the Lone Star Gas Co. to drill six gas tests in the territory.

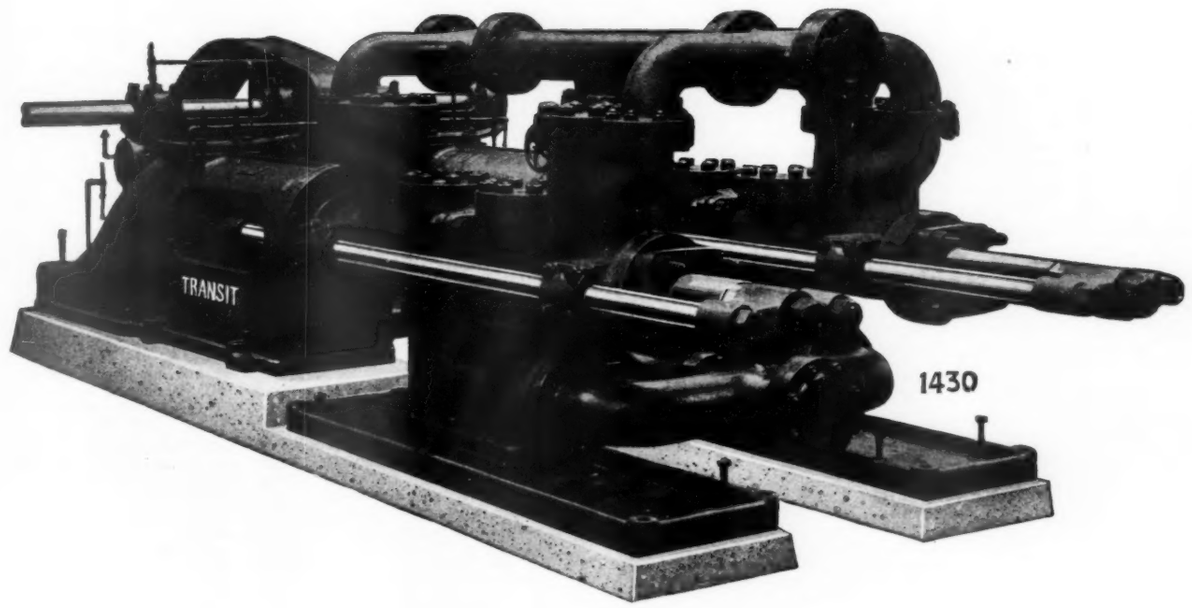
In the Cedar Creek area in Limestone County, the J. K. Hughes Development Co.'s No. 1 Lewis Rapp was running pipe at 2,879 feet and its No. 1 J. and E. Ray was drilling at 2,590 feet. The Transcontinental Oil Co.'s No. 1 Dugger was abandoned at 2,927 feet. No. 2 Dugger was abandoned at 2,909 feet. Reiter, Lewis and others' No. 1 Dugger was abandoned at 2,930 feet, and Simms Oil Co.'s No. 1 Dugger was abandoned at 2,927 feet. Reiter Lewis and others' No. 1 Lewis made 324 bbls. the first 24 hours. Hunt, Hicks and others abandoned their No. 1 Priddy, southeast of the Cedar Creek Pool, at 3,301 feet. This well was located on a fault and the acreage is owned by the Humphreys Corp. and the Magnolia Petroleum Co. Hunt and his associates drilled on an acreage agreement.

In Anderson County the Humble Oil & Refining Co.'s No. 2 Spencer Clemmons was drilling anhydrite at 3,622-32 feet. The same company has a rig up for No. 1 Jones, also in the Boggy Creek area.

In Cherokee County the Humble Oil & Refining Co.'s No. 2 Reynolds was dry and abandoned at 4,648 feet. Its No. 3 Earl & Ragsdale was drilling hard shale at 1,766 feet, and its No. 2 Elliott & Clark at 3,525 feet, where pipe was set. Nineteen miles southwest of Rusk, in Henderson County, The Texas Company's No. 1 Schultz was drilling at 2,473 feet.

The Roxana Petroleum Corp. has a geophysical crew at work in Anderson County about 4 miles south of Palestine and 4 miles northeast of Jackson in Cherokee County. The Gulf Production Co. will start a test on the Bullard Dome east of the town of Bullard. The dome was recently located by a seismograph crew. The Bluie Oil Co. has taken a 12,000-acre block south of Garrison, Nacogdoches County on a drilling contract and will start a test in the northeast of the Griffin 307 acres, John W. Anderson Survey, in the northeastern part of the county.

TRANSIT
Pipe Line Pumps



Pipe Lines have enough troubles these days without paying too much for pumps, or buying pumps not exactly suited to their work. The Texas Type power pump illustrated above is regarded very highly by many experienced pipe line men because it overcomes so many of the little annoyances found in pumps less adapted to pipe line work.

STRENGTH is there by reason of correct design, and not by a preponderance of unnecessary metal.

ACCESSIBILITY is well taken care of in the design and is further enhanced by extreme simplicity.

DURABILITY too has been attained by large bearing surfaces, broad faced herringbone gears and deep plunger stuffing boxes, made especially long, to minimize packing pressure on plungers.

The fluid pumped travels through short direct passages of liberal area, and of easy turns and bends in a natural way without the objectionable "churning" so often experienced with ill adapted pumps.

Our line of pumps is complete for either light or heavy pipe line service. A letter from you describing your conditions will bring our recommendations, or if you prefer we will send an engineer to go over your conditions.

Representatives

FRICK-REID SUPPLY COMPANY
Tulsa, Okla., or any store.

ASSOCIATED SUPPLY COMPANY
Los Angeles, San Francisco, Bakersfield, Fellows

E. L. WILSON HARDWARE CO.
Beaumont, Texas.

NATIONAL TRANSIT
Pump & Machine Co.
Oil City Pa.

DISTRICT OFFICES
NEW YORK PHILADELPHIA PITTSBURGH
CLEVELAND HOUSTON TULSA DENVER

Representatives

THE GLOBE SUPPLY & MACHINERY CO.
New Orleans, La.

F. C. RICHMOND MACHINERY CO.
Salt Lake City, Utah.

MORTON Mcl. DUKEHART & CO.
Baltimore, Md.

REEVES & SKINNER MACHINERY CO.
St. Louis, Mo.

Edmundson	2	1,169
Holmsley	5	4,647
Ingram	1	35
Lena	3	352
Seay	4	2,273
Simpson	4	662
Sparks	7	5,281
Mid-Continent:		
McCumber	7	1,480
Mid-Kansas:		
Anderson	2	190
Phillips:		
Dunnaway	1	47
Graham	6	969
Philmack:		
Dobbs	..	....
Prairie:		
Baker	1	45
Davis	3	1,395
Graham, C.	4	2,365
Graham, O.	2	5,040
Stidham	9	9,170
Shaffer:		
Clark	1	347
Roxana:		
Bayliss	1	17
Hearn	1	....
Spencer	2	2,453
Sinclair:		
Foreman	1	18
Hollins	3	5,270
Skelly:		
Spencer	2	7,798
Anderson	1	95
Texas:		
Brown	4	1,635
Rodgers	2	7,380
Wilmont	4	220
Tidal:		
Watkins	4	2,425
Twin State:		
Barker	3	8,365
Hearn	1	1,710
Total, Earlsboro	220	171,234

Bowlegs

Amerada:		
Rasco	8	5,340
Atlantic:		
Baker	4	1,550
Fleet	4	1,338
Grayson	2	2,208
Jones, C.	3	205
Atlantic & Denver:		
Jones, A.	1	789
Barnsdall:		
McNac	1	50
Murrow	4	1,762
Carter:		
Bowlegs	3	1,690
Burden	2	410
Harjoche	6	1,675
Hilly	1	1,285
McGelsey	1	....
Walker	2	710
Wise	12	9,515
Jones	1	2,046
Empire:		
Lacy	6	1,129
Wise	2	1,797
Gypsy:		
Bowlegs	1	450
Brown	1	100
Cumsey	4	1,555
Grayson	4	2,805
Walker	8	3,285
Wise	3	148
Independent-Marland:		
Coker	1	10
Indian Territory:		
Barnett	2	936
Billington	4	1,211
Bowlegs	11	2,707
Davis	4	2,017
Fay	5	4,207
Goforth	11	2,707
Livingston	11	7,751
Lizzie	2	608
Walker	8	1,529
Wilmont	4	2,324
Work	1	231
Youngblood	4	570
Hull	1	279
Magnolia:		
Hammond	2	112
Rodgers	..	....
McColloch:		
Bowlegs	3	260
Mid-Continent:		
Baker	4	3,519
Bowlegs	1	700
Hutke	1	....
Minnehoma:		
Bowlegs	4	557
Prairie:		
Gahagan	4	880
Harber	7	3,245
Jones	2	1,370
Templeton	1	2,415
Whitney	4	80
Pure:		
Reed	16	8,727
Strothers "D"	2	1,004
Strothers "E"	1	6
Strothers "F"	1	616
Roxana & Houston:		
Taylor	6	2,187
Shafer:		
Lacy	3	537
Sinclair:		
Adam	1	....
Bowlegs	1	120
Cumsey	2	4,038
Ellen	6	4,510
Harjo	3	1,660
Jones	4	7,730
Taylor	4	4,110
Walker	4	1,755
Texas:		
Reed	8	6,445
Tidal:		
Grayson	3	1,720
Harjoche	4	2,420
Twin State:		
Jones	1	535
Total, Bowlegs	257	130,744

Seminole City

Carter:		
B. Carter	2	180
J. Carter	3	65
F. Carter	3	77
Creamer	2	50
R. Cudjo	4	600
W. Cudjo	2	30
Gilliland	2	445
Grisso, M.	1	275
Grisso, W.	6	1,045
Knapp	2	495
Killing, M.	12	10,000
Killing, G.	4	1,215
Lukes	7	1,650
Ponder	2	75
Simpson	3	185
Strother	4	750
Vierson	4	460
Jackson	1	....
Amerada:		
Fixico	4	1,149
Killing	4	510
Rentie	3	950
Atlantic:		
Cudjo, N.	3	785
Barnsdall:		
Carter	9	3,244
Henry	2	554
Jones	4	1,070
Empire:		
Gross	3	622
Wilson	2	424
Gypsy:		
Butler	3	660
Carter	3	1,285
Cudjo	5	712
Fixico	7	245
Harjo	3	1,085
Wolf	6	203
Independent:		
P. Fixico	3	310
Harjo	3	500
Independent & Garland:		
T. Fixico	8	855
Independent & Inter-Ocean:		
Jones	4	424
Indian Territory:		
Allen	2	579
Bowlegs	11	3,061
Fleet	1	91
Gooden	4	79
Harjo	4	633
James	4	1,015
Reed	3	26
Kingwood:		
Johnson	3	1,266
Magnolia:		
Born	1	94
Franks	4	968
Mid-Continent:		
Rentie	9	1,525
Tayeche	7	390
Mid-Kansas:		
Jacksey	1	21
Pressley	1	....
Wilkins	2	712
Phillips:		
Strothers	3	168
Philmack:		
Butler	3	2,290
Prairie:		
Gross	5	100
Mason	1	471
Spencer	1	10
Strother	5	1,245
Pure:		
Strother, A.	17	3,517
Strother, B.	5	1,910
Strother, C.	1	26
Roxana:		
Harber	3	382
Lashley	2	58
Sinclair:		
Carter	2	30
Cudjo, A.	6	900
Cudjo, B.	4	1,110
Dicey	2	840
Fixico	4	900
Slick:		
Cudjo	3	766
Franks	8	1,734
Giblet, Sam	3	2,956
Tiger	1	76
Superior:		
Cudjo	4	894
Texas:		
Mayhue	1	320
Strothers	2	60
Tidal:		
Carter	5	340
Fixico	8	548
Harjo, D.	3	1,575
Harjo, T.	6	275
Mahardy	2	215
Tayeche	3	35
Turman:		
Cudjo	4	747
Grisso	1	194
Jones	4	1,017
Total	326	69,356

Searight

Carter:		
Davis	7	4,630
Frazier	5	4,595
Kiker	1	35
Mandler	2	40
Scott	1	30
Amerada:		
Johnson	1	90
Strother	1	1,170
Gypsy:		
Cudjo	3	897
Mid-Continent:		
Grayson	6	1,015
Soloche	2	1,170
W. B. Pine:		
Lulia	1	....
Prairie:		
Cannon	1	15
Carter	1	50
Houck	1	5
Kincaid	7	95
Wiemer	1	20
Pure:		
Aldridge	5	5,892
Roxana:		
Strother	2	1,652
Sinclair:		
Polly	4	2,550
Twin State:		
Varnum	2	970
Wilcox:		
Chupco	6	4,669
Total	60	29,590
Total Little River	33	38,518
Total Bowlegs	257	130,744
Total Earlsboro	220	171,234
Total Seminole	326	69,356
Total Searight	60	29,590
Grand total	896	439,442

Pottawatomie County

Amerada Petroleum Corp.'s No. 6 Cowden, NW cor. SE SW Section 4-9-5, Earlsboro Pool, had an initial production of 300 bbls. in the Wilcox sand at 4,299-4,345 feet. Gypsy Oil Co.'s No. 1 Hunic, NW cor. SW SW SE Section 5-9-5, had Wilcox sand at 4,453-62 feet and made 607 bbls. Independent Oil & Gas Co. and Darby Oil Co.'s No. 6 Knapp, NW cor. NE NE Section 8-9-5, swabbed 575 bbls. from the Wilcox sand at 4,368-87 feet. Gypsy Oil Co.'s No. 4 McFarland, NE cor. SW SW Section 9-9-5, is dry and abandoned in the Wilcox sand at 4,348-4,445 feet. Amerada Petroleum Corp.'s No. 2 Johnson, NW cor. NE SE Section 4-9-6, topped the Wilcox sand at 4,483 feet, drilled in to 4,520 feet and plugged back to 4,328 feet where it swabbed 70 bbls. Carter Oil Co.'s No. 7 Davis, SE cor. NE Section 4-9-6, Searight Pool, made 245 bbls. from the Wilcox sand at 4,514-33 feet. Gypsy Oil Co.'s No. 3 Cudjo, SE cor. SW NE Section 4-9-6, had Wilcox sand at 4,333-4,409 feet and made 372 bbls. Indpendent Oil & Gas Co. and others' No. 2 Brown, NW cor. SW NW Section 14-7-4, Pearson area, is pumping 200 bbls. from the Hunton lime at 3,617-48 feet. Twin State Oil Co.'s No. 3 Spangy, NW cor. SW SE Section 19-7-4, was completed for 80 bbls. on the pump from Hunton lime at 3,715-65 feet. Magnolia Petroleum Corp.'s No. 1 Keiner, SW cor. Section 17-7-5, has been completed for 48 bbls. in Hunton lime at 3,970-4,134 feet. No. 1 Bullock, SE cor. Section 18-7-5, found the Viola lime at 4,040 feet, drilled in to 4,080 feet and is pumping 29 bbls.

Seminole County

Jarvis & Holm made location and the cellar is being dug for No. 1 Buchner, SW cor. SE SE Section 6-9-8. Magnolia Petroleum Corp. is building the rig for No. 10 Seay, NW cor. SW Section 12-9-5, Earlsboro Pool. Indian Territory Illuminating Oil Co. has the cellar dug for No. 7 Fay, NE cor. SE NW Section 13-8-6, Bowlegs Pool. She cellar is also dug for No. 8 Fay, NW cor. NE SW Section 13-8-6. Indian Territory Illuminating Oil Co. and Phillips Petroleum Co. are building the rig for No. 1 Fore, SE cor. NE NW Section 35-8-6, Little River Pool. W. B. Pine and Phillips Petroleum Co. made location for No. 3 Pattey, NW cor. SW NE Section 35-8-6. T. B. Slick has the rig on the ground for No. 1 Moore, SW cor. NE SW Section 1-6-6.

Continental Oil Co.'s No. 1 Blevins, SW cor. NW SW Section 28-10-7, is dry and abandoned at 4,660 feet. Philmack Oil Co.'s No. 1 Sango, SE cor. NE NW Section 1-9-5, Earlsboro Pool, drilled to 4,350 feet and was abandoned. Barnsdall Oil Co.'s No. 3 Bruner, SE cor. NE NE Section 10-9-5, had an initial flow of 3,643 bbls. from the Wilcox sand at 4,282-96 feet. Gypsy Oil Co.'s No. 4 Bruner, SE cor. NW NE Section 10-9-5, made 1845 bbls. from the Wilcox sand at 4,333-58 feet. No. 8 B. Carter, NE cor. SE NW Section 11-9-5, flowed 1,950 bbls. from the Wilcox sand at 4,512-21 feet. Independent Oil & Gas Co. and Margay Oil Co.'s No. 4 Gaines, SW cor. NE NE Section 11-9-5, producing from the Wilcox sand at 4,390-4,410 feet, made 1,100 bbls. by agitation.

Magnolia Petroleum Corp.'s No. 7 Sparks, SW cor. NW SW Section 11-9-5, had the Wilcox sand at 4,272-88 feet and made 2,224 bbls. initial. Continental Oil Co.'s No. 4 Hollins, NE cor. SE NW Section 12-9-5, topped the Wilcox sand at 4,230 feet, drilled in to 4,254 feet and made 4,500 bbls. after the sand was shot. Magnolia Petroleum Corp.'s No. 2 Seay, SE cor. SW SW Section 12-9-5, was completed for 893 bbls. in the Wilcox sand at 4,510-17 feet. Twin State Oil Co.'s No. 4 Barker, SE cor. NW NE Section 12-9-5, came in for 2,695 bbls. in the Wilcox sand at 4,237 feet. Indian Territory Illuminating Oil Co.'s No. 1 Allen, SW cor. NE Section 25-9-6, Seminole Pool, made 684 bbls. the first day from the Wilcox sand at 4,270-81 feet. No. 2 Allen, SE cor. SW NW Section 25-9-6, made 182 bbls. on the pump, producing from the Wilcox sand at 4,382-89 feet, where it was plugged back from 4,391 feet. Carter Oil Co.'s No. 1 Jackson, SE cor. SW NE Section 27-9-6, was completed for 135 bbls. from the Wilcox sand at 4,245-67 feet. Sinclair Oil & Gas Co.'s No. 4 Taylor, NE cor. NW SE Section 10-8-6, flowed 500 bbls. initial from the Wilcox sand at 4,005-4,124 feet. No. 5 Ellen, NE cor. NW SW Section 11-8-6, made 275 bbls. from the Wilcox sand at 4,335-46 feet.

Gypsy Oil Co.'s No. 4 Grayson, NE cor. NW NW Section 13-8-6, had the Wilcox sand at 4,193-4,220 feet and made 920 bbls. when the air was applied. No. 1 Henderson, NW cor. NE NE Section 13-8-6, has been shut in for 45,000,000 feet of gas in the Hunton lime at 4,375-77. Tidal Oil Co.'s No. 2 Grayson, NE cor. NW Section 13-8-6, flowed 1,215 bbls. from the Wilcox sand at 4,320-34

(Continued on Page 150)

KANSAS COMPLETIONS AND NEW WORK SHOW DECIDED DULLNESS

By J. L. Dwyer
Staff Correspondent, Kansas Fields

The past week was an unusually quiet period in Kansas. Not a new well of importance was reported and very little new work was started anywhere.

Kansas is slipping back to a point where a new wildcatting campaign will be necessary to maintain the State's prestige in the oil column, and such a campaign cannot be expected until better market conditions prevail.

Butler County

Liggett and others' No. 4 Figge, SW cor. NE Section 36-27-6, is spudding. Empire Gas & Fuel Co.'s No. 1 Hutchinson "C," SE cor. NW Section 34-27-5, is making 70 bbls. from sand at 2,703-23 feet. Skelly Oil Co. and others' No. 1 Knox, SW cor. NW Section 17-27-7, came in for 3,500,000 feet of gas in sand at 2,592-2,616 feet.

Elk County

Hood & Co.'s No. 1 Eyman, CEL SE SE Section 9-31-10, was completed for 300,000 feet of gas in sand at 1,120-26 feet. Boudell and others' No. 2 Rettig, NE cor. Section 29-31-10, came in for 10 bbls. in sand at 1,520-26 feet. Theta Oil Co.'s No. 2 Lisco, NE cor. Section 34-31-10, is producing 30 bbls. from sand at 2,284-89 feet.

Cowley County

J. A. Hull has the rig up for No. 2 Nunman. NW cor. SE SW, Section 24-32-4. Blue Stem Oil Co. has a machine on the ground for No. 2 Reynolds, SW cor. SE, Section 33-32-7. Roth & Faurot's No. 1 Baily, C NW SE. Section 5-33 5, is dry and abandoned at 683 feet.

Chase County

Kirk and others made location for No. 1 Crosby, SW cor. NW NE Section 23-22-9. Lariaux and others' No. 1 Daub, NW cor. Lot 18, Section 19-19-8, was deepened to 2,590 feet and abandoned.

Greenwood County

Skelly Oil Co. has the rig on the ground for No. 1 Prather, SW cor. NE NW Section 21-22-10. Theta Oil Co. has moved a rig out for No. 1 Fankhouser, SE cor. Section 23-22-12. Rogers and others' No. 2 Hayes, Lot 9, Block 6, Section 35-25-10, is drilling at 400 feet. No. 1 Wyant, SE cor. NW, Block 16, Section 2-26-10, is a rig under construction.

Bruce, Bradley and others' No. 1 Pixlee, SE cor. Section 3-22-10, was completed for 225 bbls. in sand at 2,078-2,156 feet. Rogers and others' No. 1 Hays, NW cor. SE SW SW Section 35-25-10, is making 40 bbls. from sand at 2,050-65 feet. No. 1 Hoover, NE cor. NW NE NW Section 2-26-10, had sand at 1,986-2,005 feet and was completed for 40 bbls.

Morris County

Hawes, Ainsworth and others' No. 1 Seastead, NE cor. SE NW Section 8-17-5, is a dry hole at 2,631 feet.

Deep Well in Pine Island Blows In

Good for 300 Bbls. and Best Well Completed in North Louisiana-Arkansas Field for Some Months

By Neil Williams
Staff Correspondent, Louisiana-Arkansas

SHREVEPORT, La., Oct. 17.—The routine of salt water and small gas showings encountered in recent weeks in the deep Trinity horizon development of the Pine Island Field of Caddo Parish was broken to some extent the past week when one of The Texas Company's deep wells blew in good for 300 bbls. daily. This was the first new oil tapped in that field in many weeks.

This also was the best well which had been completed in the entire North Louisiana-Arkansas division for a long time, the past week being marked by the bringing in of only two other comparatively small producers, one in Smackover and the other in Nevada County, Arkansas, and five small or mediocre gas wells. Six other tests were abandoned.

The Texas Company's well, No. 9 Herold, Section 14-21-15, blew in at a depth of 3,642 feet with the drill stem in the hole. It was being drilled deeper and had gone just two feet after being bailed in at a depth of 3,640 feet, making only 4,000,000 feet of gas. The present depth is at the top of the second pay formation. This well previously had been tested at depths of 3,569 feet and 3,625 feet, where small showings of gas were encountered.

Pine Island Trinity Horizon

Developments in the Pine Island Trinity horizon drilling have been extremely unfavorable the past two months with the steady string of new wells testing only small flows of gas, lots of salt water and with little or no showing of oil. Among the latest of these wells was Dixie Oil Co.'s No. 89 Dillon, Section 14-21-15, which was bailed in the latter part of the week making only 5,000,000 feet of gas from a depth of 3,780 feet. One deep test, Golden Rod Oil Co.'s No. A-1 Hampton, Section 15, was abandoned during the week after drilling to a depth of 4,050 feet. The Texas Company has three shut down but nearly all other deep wells which have tested unfavorably at their present levels are being drilled deeper in hopes of picking up still deeper production.

Other fields of Arkansas and North Louisiana failed to produce any news of importance during the week. The Champagnolle wildcat pool of northeastern Union County, Arkansas, continued to hold considerable interest in view of the possibilities there. Seven new tests are starting in that district, which from present indications soon may become an active drilling spot.

Champagnolle District

Magnolia Petroleum Co.'s No. 1 Carroll, Section 1-17-14, in the Champagnolle district, has been flowing steadily for more than two weeks and Saturday still was producing at the rate of 360 bbls. daily. It was reported that the gas pressure had fallen off materially but the oil had shown no decline. However, the discovery well, Ohio Oil Co.'s No. 1 Crain, to which the Magnolia well is a northeast offset, was reported to have dropped during the week to 30 bbls. daily after pumping steadily between 45 and 50 bbls. of almost clean oil since the latter part of June. Ohio Oil Co.'s second Crain well, the only other producer in the field, has been killed and a string of 4½-inch casing will be cemented in an attempt to shut off the heavy flow of salt water, not encountered by the other wells. The No. 2 Crain flowed 30 bbls. of clean oil in the first half hour but salt water broke in through a bad casing seat.

Trading of acreage in the division was quieter during the week than for several months. This was reflected particularly in eastern and northeastern Louisiana, where leasing had kept fairly active despite the sluggishness in other areas.

Production Steady

Production continued steady, an increase of only 640 bbls. in the daily average being shown during the week. The increase was due largely to the El Dorado Field, which jumped up over 1,000 bbls. daily, although no new production was added. Total daily average production for the week was 152,690 bbls. By fields it was:

North Louisiana	
Caddo light	13,445
Caddo heavy	4,785
Homer	4,750
Haynesville	7,175
De Soto-Red River	4,050
Elm Grove	650
Bellevue	1,235
Cotton Valley	5,175
Urania	9,325
Pleasant Hill	1,030
Total	51,620
Arkansas	
El Dorado	6,130
Lisbon	2,980
Smackover light	9,995
Smackover heavy	77,570
Stephens	1,220
Nevada	3,050
Bradley	125
Total	101,070
Total both states	152,690
Total last week	152,050
Increase	640

A summary of the week's operations showed 13 completions, 21 wells waiting on pumping rigs, 21 temporarily abandoned, 158 drilling, 12 rigs, 33 derricks and 20 locations.

North Louisiana

Bossier Parish

R. L. Crook has completed another shallow well in the Bellevue Field, the No. 7 Larkin, Section 14-19-11. It is making an estimated 250,000 feet of gas with a spray of salt water. Humble Oil & Refining Co.'s deep test, No. 30 Bliss & Wetherbee, Section 15, is being reamed to the bottom at 4,219 feet. In the Elm Grove district, J. S. McCullough, trustee, has 500 feet of oil standing in No. 3 Hodges, Section 25-16-12, from a sand at 1,557-58 feet. The well is to be put on the pump.

Caddo Parish

Arkansas Fuel Oil Co.'s No. 1 Huckaby, Section 14-21-15, Pine Island Field, tested an estimated 100 bbls. of oil at 3,906 feet, but it is to be deepened. This company's No. 2 Bashara, Section 23, got an estimated 4,000,000 feet of gas with a showing of oil and water at 3,635 feet. It also will be deepened. Arkansas Natural Gas Co.'s No. 2 Lane, Section 13, is drilling at 3,679 feet. Dixie Oil Co.'s No. 9 Caddo Mineral Land, Section 23, is drilling lime at 3,461 feet. No. 89 Dillon, Section 14, is to be bailed at 3,780 feet. No. 90 Dillon is down 3,597 feet with 8¼-inch casing cemented at 3,588 feet. On the Files & Mabry lease, also Section 14, Dixie Oil Co.'s No. 6-B is having 6¼-inch casing set at 3,695 feet. No. 2-A Noel, Section 13, is drilling lime at 3,965 feet. No. 10 Slattery, Section 27, is drilling red shale at 4,117 feet.

Golden Rod Oil Co.'s Pine Island deep test, No. 1-A Hampton, Section 15, has been abandoned after encountering salt water at 4,050 feet. Haynes Brothers' No. 2 Murray, Section 14, is drilling shale at 3,870 feet. These operators' No. 2 Spell, Section 15, is to be deepened after testing salt water with only a showing of oil at 3,093 feet. Magnolia Petroleum Co.'s No. 8-A Hampton, Section 15, is drilling lime at 2,190 feet. This company's No. 21 Robertshaw, Section 23, is to be deepened after testing 22,000,000 feet of gas at 3,607 feet. Magnolia has a derrick up for No. 22 on the Robertshaw lease. In the same section, The Texas Company is drilling at 3,635 feet in No. 49 Caddo Mineral Land. This well tested 3,000,000 feet of gas at 3,625 feet. No. 50 on this lease is down 3,578 feet with 8¼-inch casing set at 3,573 feet. No. 51 has been shut down at 3,580 feet. The Texas Company cemented a cavity at 3,727 feet in No. 6 Herndon, Section 14, and now is drilling out. No. 8 Herndon is down 3,650 feet with 8¼-inch casing cemented at 3,598 feet. This casing has been set at 3,580 feet in No. 9 Herndon. No. 9 on the Herold lease, this section, is being swabbed for a test at 3,640 feet. No. 10 Herold is shut down at 3,570 feet. No. 14-B Noel is down 2,602 feet with 10-inch casing cemented at 2,600 feet. No. 10 Mabry, Section 15, is shut down waiting on a milling tool after killing a gas blowout at 3,690 feet. No. 19 Raines, Section 15, has 8¼-inch casing cemented at 3,758 feet.

The Palmer Corp. is to make a test of a formation encountered at 3,098 feet in No. 1 Sellington, Section 17-21-14, east of the Pine Island district.

In the Waskom and Greenwood districts, J. R. Bahan is drilling at 900 feet in No. 1 Abney, Section 31-17-16. Belchic & Laskey's No. 2 Sharp, Section 10-18-16, has been completed making 10,000,000 feet of gas from sand at 906 feet. J. O. A. Carper's No. 1 Hammock, Section 27-18-16, is drilling at 790 feet. Greenwood Producing Co. has cemented 6-inch casing at 2,536 feet in No. 1 McCutcheon, Section 15-17-15. Total depth of the hole is 2,557 feet. This company's No. 3 Angurs, Section 6-16-16, is down 603 feet. Magnolia Petroleum Co. has cemented a cavity at 1,765 feet in No. 1 J. W. Furrh, Section 28-18-16. In this company's No. 1 John Furrh, Section 32, 13⅜-inch casing has been cemented at 212 feet.

T. D. Gray and associates' No. 1 Hart, Section 29-21-16, main Caddo Field, is down 2,232 feet with 4½-inch casing cemented at 2,228 feet. Standard Oil Co.'s No. 15 Hart, Section 34, is to be put on the pump, having encountered an oil sand at 1,825-32 feet. This company has a rig up for No. 53 Helpman, Section 16.

In the northwest corner of the parish, Ohio Oil Co. has a location for No. 1 Thompson, Section 32-23-16. Tubbs and associates' No. 1 Hines, Section 9-14-16, southwestern corner of the section, is shut down for fuel at 1,241 feet. Woodley Petroleum Co. got an estimated 1,000,000 feet of gas in No. 3-B Knight, Section 11-15-12, southeastern corner of the parish. The well, however, caught fire and did considerable damage to the derrick before being extinguished. The derrick now is being repaired preparatory to deepening the test. The gas was from a sand at 2,459-66 feet. Woodley & Collins are rigging up for No. 1-A McVey, Section 23-19-14.

LaSalle Parish

Elbert Petroleum Co. is swabbing No. 5 Urania, Section 7-10-2e, Urania Field, for a test of a sand at 1,518-24 feet. Natural Gas & Fuel Corp. is coring at 1,848 feet in No. 12-M Urania, Section 20-10-2e. Pima Oil Co. has a rig up for No. 10 Urania, Section 7-10-2e.

Monroe District

Natural Gas Producing Co. is drilling at 2,142 feet in No. 9 Tensas Delta, Section 27-22-4e, Morehouse Parish. The Texas Company is drilling lime at 3,136 feet in No. 1 Silvey, Section 22-20-6e.

In Ouachita Parish, C. W. Frierson

(Continued on Page 148)

SHOWINGS IN CARTERVILLE WILDCAT STIMULATE HOPES OF TAPPING POOL

By Neil Williams

SHREVEPORT, La., Oct. 17.—Hopes of tapping an oil pool somewhere in the vicinity of the wildcat Carterville area of northern Bossier Parish, Louisiana, were stimulated materially the past week by showings encountered in Sales & Walker's No. 3 Bollinger, Section 30-23-11. The showings were so favorable that the operators have decided to run a string of 4½-inch casing to test the well.

The oil came to light during attempts to make a test of a sand entered 2½ feet below 3,081 feet. While attempts to make the test failed because of the small size of the hole, in running the tool and drill stem into the hole oil showed up through 3,000 feet of rotary mud and covered the pit. The tool later was found filled with oil.

Although this does not indicate a commercial well in view of treacherous conditions existing in Bossier Parish sands and due to possibilities of salt water, yet the showings in this test were heavier than in many tests which have turned out big producers.

This test is approximately 3 miles southeast of the Carterville Field and on the western edge of the Sarepta gas field. It originally was completed at a depth of 2,690 feet several years ago making gas but recently has been deepened to its present level. Another test, The Texas Company's No. 1 Wilkerson, Section 36-23-12, a mile southwest of Sales & Walker's test, also is being watched. It tested 500,000 feet of gas with a showing of salt water at 2,707 feet but has been deepened to the Carterville pay level where, as the week closed, another test was to have been made.

Franklin Parish

Other interest in wildcatting in the North Louisiana-Arkansas division was centered largely on Pittsburgh Exploration Co.'s No. 3 Moore, Section 12-11-6e, Franklin Parish. This test was expected to pick up the gas sand at 720-30 feet from which the same company's No. 2 Moore, 600 feet north, was supposed to have blown out at 701-34 feet. Instead, after casing was set at 710 feet, the test cored salt water sand at 750-55 feet and at 840 feet cored another salt water sand.

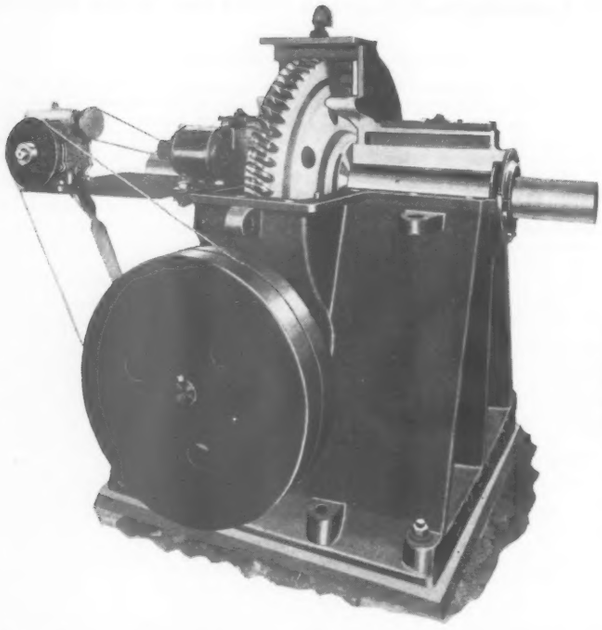
This caused some speculation as to whether the blowout in No. 2 Moore really was from the 710-34-foot sand or from another formation. The test was drilling at 1,385 feet when the blowout occurred but it was indicated the gas was from the shallower level where showings had been encountered by other tests in the parish. No. 2 Moore was abandoned because of a heavy salt water flow was planned to case that off in the No. 3 Moore.

A Catahoula Parish wildcat, Lochnager Oil & Gas Co.'s No. 2 Beasley, Section 26-9-6e, which also is being watched closely, had not drilled plug and tested at the close of the week. Casing is cemented at 3,114 feet. Testing of this wildcat is of importance in view of the 40,000,000 foot gas blowout in the first Beasley test, which was abandoned recently because of salt water.

Outside of the Champagnolle district,

(Continued on Page 149)

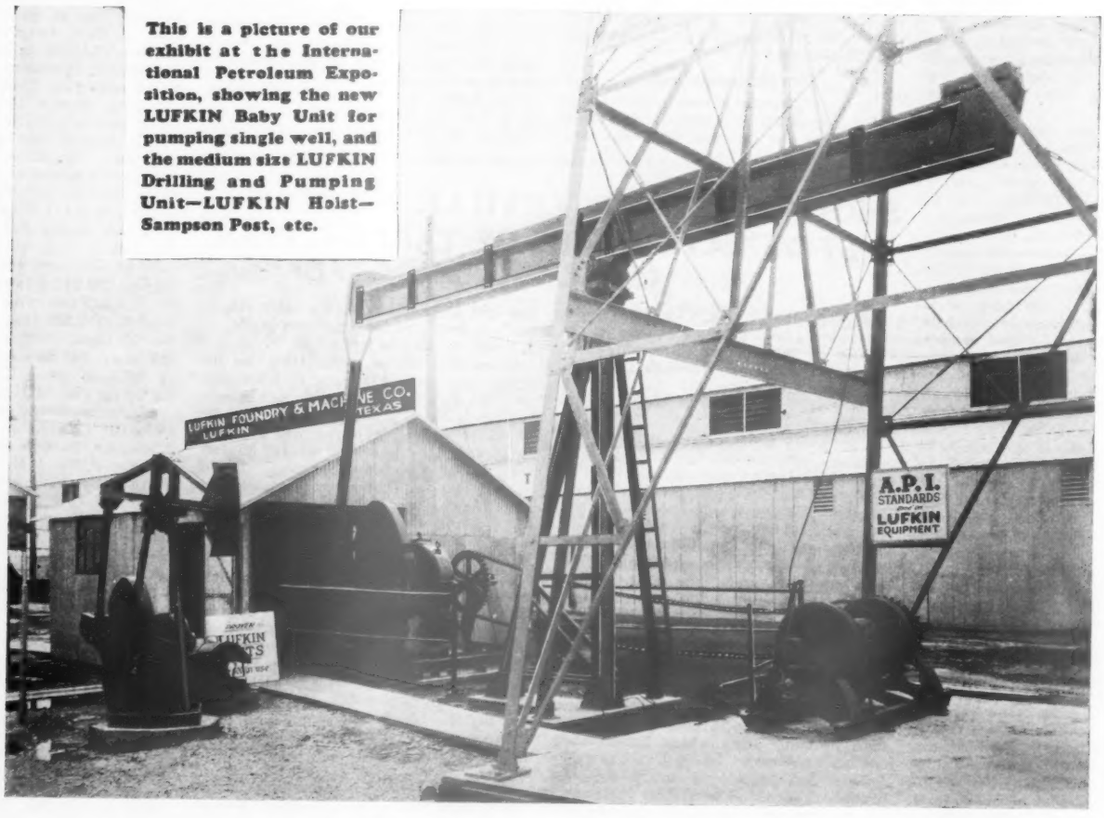
L U F K I N



1-6 Horse power Motor Pulling LUFKIN Unit at the Exposition.

AT THE PETROLEUM EXPOSITION

This is a picture of our exhibit at the International Petroleum Exposition, showing the new LUFKIN Baby Unit for pumping single well, and the medium size LUFKIN Drilling and Pumping Unit—LUFKIN Hoist—Sampson Post, etc.



Manufactured at Lufkin, Texas, by

THE LUFKIN FOUNDRY AND MACHINE CO.

District Office, Tulsa, Okla.

Los Angeles, Cal. **Eldorado, Ark** **New York, N. Y.**

Spindletop Wells Feature Gulf Coast

Deepest Producer in Field Comes in Making 4,200 Bbls. From 5,831 Feet but Dropped to 1,350 Bbls. Later

By Staff Correspondent

HOUSTON, Tex., Oct. 17.—Spindletop, with three big wells, one of which was the deepest producer in the field, was the focal spot of interest in the Gulf Coast fields during the past week. It took those three wells to hold the fast falling production in Spindletop on an even keel. Production of Spindletop showed a slight gain, as did the entire coastal region.

Sun Oil Co.'s No. 14 McLean was the big well of the week and not only the deepest producer in Spindletop but one of the deepest in the coastal region. It came in making 4,200 bbls. of 27.3 gravity oil from 5,831 feet. However, the more than a mile deep producer fell off rapidly in production. Saturday morning the well was making 1,350 bbls. of net oil.

The Sun Oil Co. got another good well in the mile deep zone when No. 7 McLean was completed at a total depth of 5,019 feet making 3,200 bbls. of 28.5 gravity oil. The well came in but a few days following the completion of No. 14. Late reports from the field were that No. 7 was holding its production fairly well.

Late in the week the Yount-Lee Oil Co. brought in another big flush producer on its Gladys lease. No. 43 was good for 3,000 bbls. of 24.3 gravity crude initial at 3,284 feet. Aside from the 10,400 bbls. of flush production in Spindletop this week there was little new oil brought in. A few small pumpers or flowing wells scattered over the entire coastal region summed up the new producers for the week.

Deep Tests Abandoned

Several deep tests were abandoned as failures. At Hawkinsville in Matagorda County a 4,750-foot test was abandoned without a show. In rank wildcat territory of Fayette County a 3,150-foot test was abandoned. At Orchard a 4,300-foot test went off the boards.

Rycade Oil Corp.'s No. 12 Nash at Nash dome, one of the deepest drilling wells in the Gulf Coast region, is being followed with interest. Late in the week the well was drilling at 6.025 feet without anything showing. On the east side of Barbers Hill the Humphreys Corp.'s No. 5-B Kirby is drilling in water sand at 4,624 feet. The well has encountered water sand all the way down from 4,200-600 feet with a slight show of oil in one sand.

Harrison Oil Co.'s No. 2 Quintette at North Dayton is expected to tell its story within the next week. The well is drilling at 4,145 feet and is figured to strike the pay found in the discovery well of North Dayton within the next 100 feet of drilling.

The Pure Oil Co. has quit work at Stratton Ridge in Brazoria County after having tested two sands dry. Both sands carried a slight showing of oil. The Associated also quit that area. Gulf Production is drilling one well in that area.

There is considerable activity around the Dewalt area in Fort Bend County. Gulf County took a 151-acre lease in the William Little Survey and Spencer & Mullens took a 468-acre lease in the Elijah Roark Survey. The latter entered a contract to drill a well in six months or forfeit the lease and be penalized to the extent of $4 per acre.

Shooting Claudine Area

One crew is shooting around the Claudine area but there was no new machine work reported in Wharton, Matagorda, Jackson or Brazoria County during the week except at Hoskins Mound in Brazoria County where one company is experimenting with a new machine.

Over in Louisiana a warm play has developed in Jefferson Davis County around Sections 6 and 7 in Townships 9s and Range 5w and Section 1 and 12-9-6. Several companies are active in that area buying acreage. Southwest of Egan in Acadia Parish some trading has been reported.

J. W. Gardiner of Lake Charles obtained a lease covering Lage Mongoulois and tributary streams paying the State of Louisiana $4,444.44 for the lease. The lake is roughly located in Township 10s and Range 9e. The only other acreage trade of importance during the week was the Gulf company's purchase of the east 60 acres of the E half of the SW of Section 16-9-11 in the Edgerly area. It is reported the purchaser paid around $6,000 for the lease.

Estimated Production

Production in the coastal area showed an increase of 1,654 bbls. over the previous week's estimate. All fields in the Louisiana district showed a gain. Columbia in Texas showed the sharpest drop when it lost 2,000 bbls. That was offset, however, by the 2,000 bbls. gain in Pierce Junction. Despite the new production in Spindletop it gained only 1,000 bbls. in daily average. The estimated daily average production in the Gulf Coast region, east central Texas and southwest Texas for the week ending October 15 follows:

Spindletop	50,472
Saratoga	1,059
Batson	1,246
Goose Creek	7,737
Sour Lake	4,076
Hull	17,927
Big Creek	4,331
Columbia	8,158
Humble	3,625
Pierce Junction	10,802
Blue Ridge	2,526
Markham	250
Orange	4,419
Damon Mound	820
South Dayton	226
South Liberty	2,152
High Island	63
Moores Field	44
Boling	2,322
Nash Dome	1,775
Barbers Hill	650
Vinton	5,006
Starks	634
Edgerly	2,290
Evangeline	1,351
Lockport	5,965
Lareauville	.....
Sweet Lake	.....
Sulphur	85
Total this week	140,009
Total last week	138,355
Difference	1,654
East Central	
Mexia	9,382
Cedar Creek	305
Nigger Creek	1,880
Currie	605
Wortham	2,645
Richland	730
Powell	14,327
Total this week	29,874
Total last week	31,084
Loss	1,210
Southwest	
Somerset	2,386
Lytton Springs	1,712
Dale	410
Luling	15,816
Miscellaneous	9,491
Total this week	29,815
Total last week	29,997
Loss	182

COMPLETIONS

Austin County

Humble Oil & Refining Co.'s No. 1 Remmert is drilling at 800 feet. Same company's No. 1 Washington was temporarily abandoned at 1,063 feet in gumbo after testing sulphur water at 820-60 feet. At Belleville the Humble company's No. 1 Kujewa had a show of gas at 1,026-30 feet and is making a test. One and one-half miles west of Peters T. G. Wood's No. 1 Trenckmann is drilling gumbo at 700 feet.

Brazoria County

Starks and associates' No. 3 Hinckle is drilling shale at 1,379 feet. Roxana corporation's No. 1 Allen State sanded up and the liner is being bailed. Roxana corporation's No. 4 Allen is being reamed at 5,283 feet. Same company's No. 2 Bell is drilling broken shale at 3,680 feet. Rycade Oil Corp.'s No. 4 Fritz Maier is drilling at 4,300 feet; No. 5 is being cored at 4,242 feet; No. 16 Wisdom is drilling at 3,200 feet and preparations for a test at 3,910 feet are being made at No. 17 Wisdom. Rycade Corp.'s deep test, No. 12 Nash, is drilling at 6,015 feet without anything showing.

Gulf Production Co.'s No. 3 Perry is drilling at 1,500 feet. Texas Gulf Sulphur Co.'s No. 1 Kropp is drilling at 810 feet. The same company's No. 2 Davidson is being reamed at 700 feet. Texas Gulf Sulphur Co.'s No. 1 Dull is drilling at 1,500 feet.

Chambers County

At High Island the McLean and Sun Oil companies' No. 6 and No. 10 Cade are rigged and ready to drill deeper. R. L. Bartlett's No. 1 Fisher is a rig. S. T. Hindman and associates' No. 1 Fisher is drilling at 3,125 feet. On the east side of Barbers Hill the Humphreys Corp.'s No. 5-B Kirby is drilling water sand at 4,610 feet.

Colorado County

An effort is being made to shut off water at 1,465 feet at R. E. Waldrop's No. 1 Tait, 1 mile north of Altair.

Fayette County

Magnolia Petroleum Co.'s No. 1 Ida Fortran, near La Grange, was dry and abandoned in hard rock at 3,146 feet.

Fort Bend County

In the Big Creek area the Gulf Production Co.'s No. 43 T. W. Davis is drilling at 2,500 feet and No. 26 on the same lease is being rigged to drill deeper. At Orchard the Gulf company's No. 13 Moore made gas with a little oil at 4,021-43 feet and sanded up. The well was drilled on down to 4,287 feet and abandoned.

In Blue Ridge the Navarro Oil Co.'s No. 3 Robinson B is drilling at 3,950 feet. Gulf Production Co.'s No. 16 Bassett Blakely C is drilling at 2,425 feet and No. 12 West Schenck is drilling at 2,600 feet. Cunningham Production Co.'s No. 2 Blakely is drilling at 1,510 feet. Gordon and associates' No. 1 Blakely is drilling at 1,625 feet. J. S. Abercrombie & Co.'s No. 4 West Schenck is being rigged up.

At Long Point Gulf company's No. 1-A Beard is drilling at 3,700 feet. Same company's No. 4 Trone was abandoned in cap rock at 1,184 feet. No. 5 on the same lease is drilling shale and lime at 836 feet. Gulf company's No. 4 Wolf topped the cap rock at 866 feet and was abandoned in gyp at 1,087 feet. In the Boling Field the Sun Oil Co.'s No. 3 J. R. Farmer was plugged back from 2,730 feet and a steam rig is being rigged up. Sun Oil Co.'s No. 2 H. R. Farmer topped the cap rock at 1,091 feet and is drilling at 1,201 feet. Same company's No. 1 Kasparek is drilling shale at 1,410 feet.

Hardin County

Orange Petroleum Co.'s No. 4 Merchant in Sour Lake is drilling at 2,510 feet. Gulf Production Co. completed two wells in Goose Creek. No. 8 Hoffman-Gaillard, an old well drilled deeper, was completed at 2,766 feet pumping 125 bbls. of 22.3 gravity crude. No. 11 Stateland Producers, another old well drilled deeper, is pumping 30 bbls. of 20.5 gravity crude from 2,543 feet. The Gulf company's No. 4 Chapman Bryan is being rigged to drill deeper as is No. 11 Hoffman-Gaillard. Gulf company's No. 26 Ashbel Smith is drilling at 5,250 feet. Humble Oil & Refining Co.'s No. 72 Simms-Smith is drilling at 4,840 feet and the same company's No. 4 Ashbel Smith is drilling at 1,200 feet.

In the Batson Field The Texas Company's No. 1 Sterling is drilling at 3,910 feet. Capital Oil Co.'s No. 9 Hodges is being rigged up. Ada Belle Oil Co.'s No. 16 Honeymoon is shut down at 410 feet. Paraffine Oil Co.'s No. 43 Knight is drilling at 610 feet. Batson Oil Co.'s No. 6 Bates is being bailed at 760 feet. J. R. Everett's No. 2 King is being rigged.

Harris County

Cullen and associates' No. 3 Howe was the only completion reported in Pierce Junction. The well made 2,500 bbls. initial from 4,848 feet. Rio Bravo Oil Co.'s No. 1 G. H. and S. A. and No. 101 on the same lease are locations. Rio Bravo company's No. 7 P. S. A. is being rigged up and No. 1 P. S. A. is being rigged up to drill deeper. No. 6-B is drilling at 3,125 feet. Moody corporation's No. 2 Hume is drilling at 3,250 feet. The Sun Oil Co.'s No. 1 Fitzsimmons is being rigged to drill deeper. Navarro Oil Co.'s No. 3 Cain is drilling at 4,325 feet. Gulf Production Co.'s No. 21 Taylor and others is drilling at 3,000. Gulf company's No. 1 H. M. Perry is drilling at 3,200 feet and No. 19 E. R. Taylor is being rigged to drill deeper. Smith and associates' No. 1 Humble company fee is drilling at 3,220 feet. Associated Oil Co.'s No. 1 Boyles is drilling at 1,400 feet. Anderson and Plummer's No. 2 Whitehead is a location.

Twelve miles northeast of Houston P. S. Griffith's No. 2 fee is shut down in gumbo at 3,517 feet. At Hockley the Marland Oil Co. and Humble Oil Co.'s No. 2 Warren is a rig. Three miles northeast of Cypress the Juanita Oil Co.'s No. 1 Kitman is shut down in gumbo at 1,175 feet. At Humble the Gulf Production Co.'s No. 1 Burt Griffith is drilling in sticky shale at 4,870 feet after cementing 6-inch pipe at 4,845 feet.

Jasper County

Raymond and associates' No. 1 Kountze Brothers, 16 miles northwest of Jasper, is drilling gumbo at 2,170 feet.

Jefferson County

Three big wells were completed in Spindletop during the week. Sun Oil Co.'s No. 14 McLean, the deepest producer in the field and probably the deepest in the Gulf Coast region, came in making 4,200 bbls. of 27.3 gravity oil from 5,831 feet. The well's production fell off rapidly and it is now making 1,400 bbls. of net oil. The same company completed No. 7 McLean at 5,019 feet flowing 3,200 bbls. of 28.5 gravity oil. Yount Lee Oil Co.'s No. 43 Gladys was completed at 3,284 feet making 3,000 bbls. of 24.3 gravity oil.

Hines Oil Co.'s No. 1 Weed is being delayed by a fishing job at 5,000 feet. Sun Oil Co.'s No. 12 McLean is shut down at 5,300 feet; No. 11 is a derrick; No. 6 is drilling at 5,830 feet and No. 4 Price is drilling at 5,225 feet. Rio Bravo Oil Co.'s No. 58 T. & N. O. is drilling at 3,490 feet. Magnolia Petroleum Co.'s No. 7 fee is drilling at 1,050 feet; No. 6 fee is drilling at 5,450 feet and No. 2 fee is drilling at 5,510 feet. J. O. Davis' No. 2 Gladys is fishing at 5,325 feet. Gulf Production Co.'s No. 16 Marrs McLean A is drilling at 3,825 feet. Same company's No. 227 Gladys is drilling at 450 feet. Gulf company's No. 11 Marrs McLean A went into salt water at 5,310 feet, but will be drilled deeper. Gulf company's No. 7 Jeanette Mann is drilling at 4,175 feet and No. 9 Daisy Roche and others is being drilled deeper after going into salt water at 3,725 feet.

Four miles northeast of Spindletop, Deep Test Oil Co. is still fishing at 2,175 feet at No. 1 McFaddin. At Fannette the Gulf Production Co.'s No. 4 Bordages is drilling gumbo at 2,440 feet. The drill stem stuck at 3,230 feet at Beaumont Oil & Prospecting Co.'s No. 1 Tyrell, 3 miles northwest of Beaumont. South Spindletop Oil & Development Co.'s No. 1 Young, 1 mile west of Nederland, bailed salt water without a showing of oil at 1,600-

(Continued on Page 149)

Westcott & Greis Service fits your needs—Perfectly

When a Westcott & Greis Engineer is called in for consultation on measurement and control problems, his previous experience in solving such matters enables him to make intelligent, beneficial suggestions. His work in your plant, in no way, conflicts with your own engineering department, or their plans. On the contrary, he is glad to work with your own field and plant men; ready at all times to place himself at their disposal in quickly and economically settling questions pertaining to accurate measurement and absolute control of air, water, gas, steam and oil through his recommendations on equipment and their installation.

When a Westcott & Greis Engineer leaves your plant, he has left a job well done, behind him; he has, in most cases, accomplished an improvement in methods, that will result in distinct savings of time, labor and actual money. If you are facing a particularly knotty problem in your gasoline plant or refinery that calls for experienced advice, you are entitled to the service of a Westcott & Greis engineer—placing you, of course, under no expense or obligation.

WESTCOTT & GREIS, Inc.
Dallas TULSA Los Angeles

WESTCOTT & GREIS
MEASUREMENT AND CONTROL

Dallas TULSA Los Angeles

New Activity in San Antonio Area

Twenty-Six Locations Made During the Week; Five in White Point District, Seven in Milam and Three in Luling

By B. D. Stevenson
Staff Correspondent, Southwest Texas Fields

SAN ANTONIO, Tex., Oct. 17.—Twenty-six locations were made in the San Antonio area of Southwest Texas last week which is a rather unusual number for this territory considering the condition of the industry at large. Five of them were in the White Point district in San Patricio County. Seven were in Milam County, including four wildcats and three in the Luling Field in Caldwell County. The remainder were scattered over the district. Milam County, in spite of the low price of crude oil, has been keeping fairly active all year in the Rockdale Field and with about four or five wildcats drilling all the time in the County.

None of the completions in proven territory had any particular significance except that the Houston Oil Co. extended the White Point gas field a quarter of a mile to the east with the completion of its No. 1 Ragsdale in the J. N. Seguin Survey at 2,565 feet, making an estimated 40,000,000 feet of gas. The same company completed a 30,000,000-foot gas well, its No. 1-A Sun, in the same field.

Light producers in the Dale Field have again caused that new pool in eastern Caldwell to look rather discouraging but it is not impossible nor even improbable that some additional porous spots in the Serpentine where the production will be fairly large. Morgan deepened his No. 1 Osteen which is 2,200 feet east of the discovery well of the field and then shot it with seven sticks of dynamite but it doesn't look like it will make more than a small well, possibly 15 bbls. It was deepened 101 feet and all but a streak of Serpentine at the top of the 101 feet was chalk but showing some oil and it was shot in the chalk.

None of the Humble wells looks very big. No. 2 Clingensmith got the Serpentine high but is only a small well. The No. 3 which is to the northwest of the No. 1, topped the Serpentine at 2,090 feet and is now at 2,450 feet and in chalk topped at about 2,400 feet. No. 4 which is one location southeast of No. 2, got the Serpentine at 1,950 feet. The No. 2 got it at 1,916 feet. No. 4 is shut down at 1,970 feet with no showing of oil and waiting orders.

Wildcatting Around Laredo

In the Laredo district most of the drilling is wildcat with almost no drilling in proven acreage with the exception of that in some new producing spots discovered more or less recently and which up to this time have not developed into real pools. In the new gas area in Webb County, 4 miles west of the Cole Field in Duval, Cole Petroleum Co. carried its No. 36 deeper after getting a lot of gas at around 2,324 feet and is now down to 5,092 feet and with announced intention of not drilling deeper than 5,600 feet. It is the deepest well ever drilled in the Mirando country and is going into new geology that is being carefully studied.

Killam is working with his new pool at the station of Bruni in Webb County and his No. 1 Bruni tested 10,170,000 feet before the well was cleaned, at 2,336 feet. It is believed it will develop into a 30,000,000-foot gasser and is the second producer in that area and in that sand. In the new territory in northwestern Duval County on Survey 60, where Schlessinger Oil Corp. lost No. 1 Moody while trying to complete it. The company has moved the rig 175 feet north and started No. 2 Moody.

In the Carolina-Texas Field, Magnolia Oil Co.'s No. 2 Webster in Survey 684 is reported at 2,609 feet to have 300 feet of fluid in the hole of which 50 was oil, has set casing and is ready to test at 3,027 feet after drilling deeper. This new depth is approximately the same and is undoubtedly the same sand as that producing in its No. 1 Webster. The sand at 2,609 feet was the same as that which produced in the Associated-Carson's discovery well and which is not only the discovery well but thus far the only one to produce in sufficient quantities at that depth.

Completions

Houston Oil Co.'s No. A-1 Sun in the White Point gas district in San Patricio has been completed estimated at 30,000,000 feet.

Houston Oil Co.'s No. 1 Ragsdale, J. N. Seuin Survey, San Patricio County in the White Point gas field at 2,565 feet has been completed estimated at 40,000,000 feet of gas and has extended the field one-quarter mile to the west.

Abandoned Tests

Magnolia Petroleum Co.'s No. 1 Taylor, G. W. James Survey, Dale Field in Caldwell County has been abandoned at 2,765 feet in the Edwards.

Gulf Production Co.'s No. 1 Witser, C. M. Cannon Survey, Dale Field, has been abandoned at 2,763 feet in the Edwards with a flow of sulphur water.

The Texas Company's No. B-1 Beatty, Nich Kelly Survey, in the Dale Field in Caldwell County has been abandoned in the Edwards dry.

Magnolia Petroleum Co.'s No. 1 Fordtran, J. R. Jones Survey, in Fayette County has been abandoned at 4,206 feet dry.

Maurer & Ellis' No. 1 Henke, in Karnes County has been abandoned dry at 2,500 feet.

Thomas and others' No. 1 Aug. Hease, Survey 124 in Wilson County has been abandoned dry at 2,754 feet in the Edwards showing little color of oil.

Breen-Woodward and others' No. 1 Dinn in the Simms Pool in Duval County, location only has been abandoned.

Pittman & Moriary have abandoned location made for the No. 8 Puig in the Aviator Field in Webb County in Block 3.

New Locations

Magnolia Petroleum Co.'s No. 18 Rios, J. Henry Survey, Luling Field in Caldwell County is a location 150 feet to SW cor.; No. 19 Rios, J. Henry Survey, is location in NE cor.; No. 6 Branyon, J. Berry Survey, is location 425 feet northeast of the No. 5.

E. A. Williams & Co. are making location southeast of LaGrange in Fayette County for test and will start drilling within 60 days.

E. A. Bainbridge has derrick lumber on ground for test in the Lewis and Toy leagues in Fayette County.

O. J. Muelder's No. 3 Rosenbrock, Duran Survey, Guadalupe County, is a location 1,000 feet to north line and 480 feet to west line.

Walker and Van Duyn are making location for a second test near Center Point in Kerr County.

Roy Shipman's No. 1 W. W. Kolb, Tract 2,420, Block 44, of the Simmons Subdivision, Live Oak County is drilling at 520 feet in stock shale.

Witherspoon Oil Co.'s No. 5 Nixon, Survey 63, Adams gas field in Medina County is drilling at 300 feet.

Southern Gas Utilities, Inc.'s No. 4 Nixon, Block 13, Adams gas field, center of block is drilling at 43 feet in rock; No. 3 Schmidt, Survey 71, Adams gas field, Medina County is a location 1,447 feet to west line and 1,340 feet to south line.

Houston Oil Co.'s No. A-2 Sun is drilling in San Patricio County in the White Point gas field; No. 1 Humble is ready to drill in.

Sexat Oil Co.'s No. 1 Hunter, is location in the White Point gas field in San Patricio County.

Mission Drilling Co.'s No. 3 Cage is location in the White Point gas field in San Patricio County.

J. J. Elam is making location for test in Victoria County.

J. W. Kemp's No. 1 Jacob is location in the J. Leal Survey at 150 feet to center of north line in Milam County.

J. W. Kemp's No. 1 Rettig is location at 250 feet to center of north line of the T. J. Chambers Survey in Milam County.

Lowenstein Oil Co.'s No. 2 Lowenstein, William Allen Survey in Milam County is location 150 feet to NW cor.; No. 3 Lowenstein, William Allen Survey, is location 300 feet southwest of No. 1.

W. S. Guthrie's No. 1 Nelly, J. Reese Survey, is location in Milam County, 1,400 feet to west line and 150 feet to north line.

Rockdale Development Co.'s No. 1 Goggans, D. Curry Survey, Milam County, is location in SE cor.

Parkhill and others are moving in machinery for the No. 1 Redick north of the Jones wildcats in Milam County.

Cole Gas Field—Duval

Houston Oil-Sun's No. 1-C S. Benavides, cor. Blocks 75-76-129-130, is testing at 1,488-96 feet through drill stem. O. W. Killam's No. 8 R. Benavides, Survey 11, Block 6, located 585 feet to northwest lines and 150 feet to southwest lines, is testing at 2,570 feet (tested gas through tested at 1,712); No. 2 Bruni, Survey 585, located 1,090 feet to west line and 150 feet to north line, is drilling at 1,830 feet after testing small amount of oil and salt water at 1,803-08 feet. Trussell, Cezeaux & Putman's No. 1 Bruni, Block 10, located 150 feet to northwest lines and 450 feet to northeast lines, at 2,344-52 feet, tested 10,000,000 feet of gas with rock pressure of 650 pounds.

Simms Field

Breen-Woodward and others' No. 1 Dinn, Survey 666, located 1,170 feet to NE cor., is location.

Humble-Reiter-Foster Pool

Humble-Reiter-Foster's No. 4 Kohler, Survey 400, located 660 feet to SW cor., is plugging to complete as oil well.

Piedras Pintas Dome

Humble Oil & Refining Co.'s No. 7 Walsh, Survey 185, located 2,050 feet to east line and 1,750 feet to north line, has sand at 3,125 feet with no odor.

Randado Field—Jim Hogg

Magnolia Petroleum Co.'s No. 29 Merchants State Bank, Survey 415, located 2,000 feet to west line and 1,775 feet to north line, has been spudded in.

Henne, Winch & Fariss Field

W. F. Morgan's No. 2 Hinnant, Block 6, located 150 feet to west line and 450 feet to north line, is drilling at 1,600 feet.

Alworth Pool

Smi-Lock's No. 1 F. S. Martinez, Survey 38, Block 4, located 560 feet to SE cor., is standing at 500 feet while 3 miles of water line is being laid. Alworth-Stevens-Hild's No. 20 M. Garza, Survey 39, Block 7, located 35 feet to southeast lines and 300 feet to northeast lines, has been spudded in.

Schott Field—Webb

Magnolia Petroleum Co.'s No. 10 Garcia, Survey 58, location, is 825 feet to west line and 1,040 feet to north line.

Aviator or Bruni Tracts

Pittman & Moriarty's (Radio) No. 8 Puig, Block 4, is a location.

Albercas Field

O. W. Killam's No. 7 Bruni, Block 65, is location 1,050 feet to east line and 150 feet to north line. Newton Drilling Co.'s

(Continued on Page 145)

DUVAL COUNTY GASSER SPRAYS OIL, BETWEEN COLE AND PIEDRAS PINTAS

By B. D. Stevenson

SAN ANTONIO, Tex., Oct. 17.—Chief interest in wildcat areas the past week in Southwest Texas is the Robert Driscoll well on Survey 23 in Duval County on land owned by Driscoll in fee. It was being drilled by the owner of the ranch and at 2,448-68 feet went into a gas sand. Casing was set and the well bailed down 300 feet when it came in a gasser spraying oil, the gas being estimated at around 15,000,000 feet. Rock pressure was reported at 700 pounds. The well is almost exactly half way between the Cole gas field in Duval Counuty on the southwest and the Piedras Pintas district in Duval County on the northeast and the three are on a straight line. On maps of Duval County Survey 23 B. S. & F. is shown at the southeast corner of a large unsurveyed tract known as the Santa Rosalia tract of Rafael Ramirez, all of which is also owned by Robert Driscoll. The location is 1,000 feet from the south line and 550 feet from the west line of Survey 23. Later the well was making some water and no oil with the gas and the driller believed the casing had parted and the water was coming from a 1,600-foot sand. A new string of casing is to be set with a packer below the break in the casing and the well tested again.

Mexicans Have Trouble

On the Mexico side of the river, the Mexican Government's No. 201 Pozo Ferronales at Ochoa and due south of Roma in Texas is not yet a well. They are having some trouble with it and it is claimed an additional string of casing must be set in it. Total depth is 3,604 feet and it was reported a few weeks ago tested through a drill stem tester as a gasser spraying oil. It has 8¼-inch casing set at 2,520 feet and 1,100 feet of 6-inch liner below that.

There were three Edwards lime tests abandoned in the Dale Field last week. When they failed to get the Serpentine they continued to the Edwards lime making them equivalent to wildcats. Magnolia Petroleum Co.'s No. 1 Taylor, a mile south of the discovery Serpentine well, was abandoned at 2,763 feet and the Gulf's No. 1 Weiters, a mile west of the discovery well, was abandoned at 2,765 feet, and The Texas Company's No. B-1 Beatty was abandoned at about the same depth. They were all in the Edwards and all got sulphur water.

The Roxana Petroleum Corp. has taken a block of leases in Travis County and is expected to start a wildcat within the next few weeks and one other major company has begun blocking some acreage. Fred Adams is starting a test in Bastrop County, and a new wildcat is to start in Victoria County. Walker and Van Duyn who drilled at Center Point in Kerr County and got a little trace of oil are preparing to drill again in a new location. The belief now is that the first

(Continued on Page 148)

La Barge Field in Wyoming More Active

Good Well Completed There. Sundance Sand Tests Important in Colorado, Utah, New Mexico and Montana Developments

By Tolbert R. Ingram
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., Oct. 17.—An encouraging note was sounded this week when it was announced that the Standard Oil Co. of Indiana refineries at Casper will immediately increase their runs of crude oil to 30,000 bbls. a day. The increase will amount to 50 per cent, the runs for several months having been around 20,000 bbls. This places the runs at normal for this time of the year and probably will continue during the winter. Accumulated stocks have been considerably reduced by the slowing down of operations.

Few completions were reported for the week. The California Petroleum Corp. completed a 247-bbl. well in its No. 7-F in the center of the La Barge Field in southwestern Wyoming, at 839 feet, and the Midwest Oil Co. has a 112-bbl. well in the Lakota sand at 2,527 feet in its No. 24-L in Salt Creek. There was one other completion at La Barge, a 38-bbl. pumper. Drilling operations are quite active in that district and production is being built up in anticipation of the construction of a pipe line in the spring. The Alliance Oil & Refining Co. refinery at Thermopolis, purchased recently by J. H. Walden, of Chicago, has been placed in operation after being idle for five years, and is running on Warm Springs crude.

Colorado

In Colorado, the Sundance sand tests on the Iles and Moffat domes in the northwestern part of the state, continue the center of interest. The Midwest Refining Co.'s No. 34-SD Parkinson, entered a sand, believed to be the Sundance, at 2,932 feet, and as it was unexpected, the hole was bridged without a test being made. Same company's No. 18-SD Parkinson topped the Sundance at 3,442 feet and 6 feet in made 400 bbls. from a very hard sand. Texas Production Co.'s No. 2 Parkinson, is flowing 514 bbls. from the Morrison. Several of the wildcats in various parts of the state are at interesting depths close to the objective sands and the next few weeks promise some interesting developments one way or the other.

New Mexico

In New Mexico, the Texas Production Co. has decided to complete its No. 1 Rhoades in Lea County as a gas well, and is abandoning its No. 1 Jackson in the same county. No completions were reported for this week. The Ohio Oil Co. is starting a new test in McKinley County, and San Juan County has a test at a critical stage in the Huntington Park Oil Co.'s No. 1 Terwilliger, which is close to a sand in the Mesa Verde at 4,025 feet. The T. C. N. Oil Co. has acquired options looking to the supplying of natural gas to Aztec and Farmington from the gas well it recently completed in the Blanco district.

Utah

In Utah, the Utah Southern Oil Co. found 800 feet of oil standing in the No. 1 Frank Shafer, on the Cane Creek Dome from a total depth of 5,000 feet, when the well was opened up to plug back. The Elk Ridge test of the Midwest Exploration Co. is nearing the final stages, being bottomed in a dry sand in the lower Pennsylvanian.

Wyoming

The best completion for the week in Wyoming was the California Petroleum Corp.'s No. 7-F, in the SW cor. NE, Section 34-27-113, of the La Barge Field, in Sublet County, at 839 feet, with an initial production of 247 bbls. This well is in the center of the field and does not prove up any new territory. La Barge has about 500 acres of proven territory and 12 wells are drilling in proven territory at the present time. Present efforts are to develop production sufficient to warrant the carrying out of the plans for building a pipe line to the railroad at Opal in the spring, the Midwest Refining Co. having contracted for the purchase of the California Petroleum's oil and, in return, building the line. The California Petroleum Corp. also has completed its No. 4-L, Section 27-27-113, at 860 feet, with an initial production of 38 bbls. on the pump. No. 4-H, NE, Section 34-37-113, reported a completion last week at 936 feet, has not yet been tested, but appears good for 100 bbls.

California Petroleum Corp.'s No. 7-D, Section 34-37-113, the deep test which recently changed to rotary, is making fair progress and is drilling at 4,686 feet. Same company's No. 6-C, Section 34-27-113, is running 6¼-inch perforated casing at 960 feet, and No. 4-G, Section 34-27-113, is drilling in sandy lime at 534 feet. No. 2-I, NW, Section 3-28-113, is reaming at 541 feet, and No. 5 J, SW, Section 34-27-113, is spudding at 140 feet. No. 3-D, NW, Section 3-28-113, is spudding.

The Rainbow Oil Co. has three wells drilling, its No. 8-A, SW, Section 3-26-113, set the 8¼-inch casing at 885 feet and has resumed drilling. Its No. 2 Baker, NW, Section 25-27-113, is drilling below 1,700 feet, and its No. 2-B, NW, Section 15-26-113, is fishing for casing at 1,310 feet. The Texas Production Co. has abandoned its No. 1 Cortez, SW, Section 15-26-113, at 1,744 feet, and its No. 1 Davis, NW, Section 15-26-113, at 1,200 feet. The last two named were core drill operations. Utah Refining Co.'s No. 1 Bird, SE, Section 21-27-113, after shutting off water at 1,330 feet, is drilling in shale at 1,495 feet, and same company's No. 1 Utah, NW, Section 10-26-113, is drilling in shale at 1,430 feet, after clearing hole of parted casing. W. D. Newlon's No. 1, SW, Section 12-26-113, has resumed drilling 785 feet after a shutdown for repairs. Wyoming-La Barge Oil Co.'s No. 1, Section 28-26-113, is drilling with a diamond core drill at 1,300 feet and the Aikin Butte Oil Co.'s No. 1, SW, Section 22-27-113, has a show of oil with same gas at 1,220 feet. The Associated Producers Corp.'s No. 2, SE, Section 35-27-113, set the 10-inch at 1,225 feet and is drilling at 1,400 feet. Midvale Oil Corp.'s No. 1, SE, Section 8-27-113, is rigging up with steel derrick. Ogden-La Barge Oil Co.'s No. 1, Lot 2, Section 18-27-113, resumed drilling after cementing the 10-inch at 1,770 feet. Reece Oil Co.'s No. 2, NW, Section 27-27-113, set the 12½-inch at 365 feet and is drilling. Fallis Oil Co.'s No. 1, Section 16-27-113, is spudding, and the Seabeck Oil Co.'s No. 1, NE, Section 35-27-113, is waiting for orders at 1,025 feet. Wyoming Producers Oil Co.'s No. 1, SW, Section 29-28-113, is drilling in lime at 1,300 feet.

One completion in Salt Creek was reported for the week, this being the Midwest Oil Co.'s No. 24-L, SW, Section 35-40-79, at 2,527 feet, with an initial production of 112 bbls. It is producing from the Lakota sand at 2,490-2,527 feet.

To Make Deep Test

On the Ant Hills anticline in Niobrara County, the Buck Creek Oil Co.'s No. 1 Delahoyde, NE NE, Section 25-36-63, the discovery well, which swabbed 250 bbls. initial, is drilling at 4,015 feet, the oil in the upper horizon having been cased off for a deep test. There have been various reports as to the identity of horizon in which the oil was found at 3,946 feet, it being reported as the Muddy, the first sand in the Dakota series, and the Newcastle sand, found in northeastern Wyoming. An analysis of cuttings appears to have definitely settled the matter and it is now accepted that the formation was the Newcastle sand. That means that the three sands in the Dakota remain to be tested. In the Osage Field, the Newcastle lies about 250 feet above the Dakota. The well, which opens a new pool, is believed to be commercial in the horizon already tested and gives considerable encouragement for bigger production in the deeper horizons. The company is building rig for its No. 1 Hattie Peterson, NW, Section 30-36-62, less than a quarter of a mile to the east of the discovery.

The Producers & Refiners Corp.'s No. 8, Section 7-26-90, on the Wertz Dome, in Carbon County, is running 15½-inch casing to a total depth of 2,323 feet. This is said to be the longest string of that sized casing ever run in Wyoming. The well being drilled with a rotary and is intended as a test to the Sundance and possibly lower horizons. This structure, which lies 2 miles northeast of the Little Lost Soldier Dome, is controlled entirely by the Producers & Refiners and is a heavy gas producer in the Dakota sands at 3,100 feet. No test has been drilled below the gas horizon.

The refinery at Thermopolis built by the Alliance Oil & Refining Co., and which has been idle for five years, has resumed operation under the management of W. B. Channel, for J. H. Walden, of Chicago, who recently purchased it at a tax sale. The new owner made a deal with C. B. Shaffer for running crude oil from the Warm Springs Field, located 4 miles to the east of Thermopolis. The oil is a black crude with asphaltum base. A late type of cracking unit will be installed to finish into lubricants and other products, and the asphaltum residue will be shipped to Chicago for use in making a substitute for ichthyol.

Another land deal on the Oregon Basin Dome in Park County was reported this week, a syndicate of Cody and Thermopolis men having purchased the Inez Ethel Frisby permit in Township 51n, Range 101w, comprising all of Sections 25 and 26, and parcels adjoining the state land in Section 36-51-101. It is the same land which the New York Oil Co. recently had under option. The syndicate will operate as the Hoodoo Oil Co., and it is stated a test will be started at once.

News regarding the results of a test of production in the Ohio Oil Co.'s No. 3 Sonners on Oregon Basin still is missing. None of the scouts have been able to learn what has taken place and it is thought possible the test may have been postponed.

Colorado

The Moffat County pools in northwestern Colorado still hold the center of attention in the Rocky Mountain area. The Midwest Refining Co.'s No. 34-SD Parkinson, SW SE SW, Section 22-4n-92, Iles Dome, proved to be the surprise for the week. On Sunday afternoon at 1:30 o'clock, it unexpectedly picked up a sand at 2,953 feet and commenced making oil. The hole was below the Dakota series and was believed to be still some distance from the top of the Morrison formation. The crew was not prepared to handle a producer since nothing was expected at that horizon, and it was necessary to bridge the hole and kill the well until the boilers could be moved back, control head placed in position and tankage provided. The oil went over the top of the casing, but no test was made and the company is not making any estimates. Others say that it flowed at the rate of 10 bbls. an hour. The well is located three-fourths of a mile southwest of the Sundance discovery well, and 1¼ miles southwest of the Texas Production Co.'s No. Parkinson, which is being tested from the Morrison. The horizon from which the oil came in No. 34-SD is not identified, but is believed to be in the top of the Morrison formation and to be from a sand not encountered in the other wells.

The Texas Production Co.'s No. 2 Parkinson, NW NW, Section 23-4-92, Iles Dome, is still being tested and is flowing by heads from sands at 3,284-88 and 3,314-25 feet. In the 24 hours ending Thursday morning, it made 514 bbls. This is a little increase over previous days and compares with 648 bbls. the first 24 hours, 477 bbls. the next 24 hours and 531 bbls. in the third period. The well will not be drilled deeper while it is producing anything like this quantity of oil. It is still believed to be more than 100 feet off the objective Sundance sand.

The Midwest Refining Co.'s No. 18-SD, NW SW, Section 23-4-92, was the first of the several tests to reach the Sundance after passing up gas at several horizons in the Morrison. The Sundance sand was topped at 3,342 feet and was drilled to 3,344 feet. The oil came in slowly as the sand was very hard and tight, but when the bailer was run several times, the flow increased. Reports at first credited the well with flowing at the rate of 1,500 to 2,000 bbls. a day in the first few hours, but actually it has not made over 400 bbls. in any 24-hour period. While that may be considered a good well from 2 feet of sand, it is not up to the discovery well. The hardness of the sand is such as to prevent it giving up the oil freely and it is being deepened by easy stages in expectation that a softer formation will be encountered. It was deepened 4 feet to 3,348 feet yesterday, but showed no increase in the flow.

Iles Dome Tests

Other Iles Dome tests are as follows: Midwest's No. 4-SD Shaw, NW NE, Section 27-4-92, cleaning out at 3,018 feet. Texas Production Co.'s No. 1 Parkinson, NW SW, Section 23-4-92, drilling in shale at 3,255 feet after cementing the 8¼-inch at 3,170 feet. At least three or four new locations are expected to be announced within the next few days.

On the Moffat Dome, Texas Production Co.'s No. 10 Knowlton, Section 33-5-91, is feeling its way down to the Sundance and is drilling in sand at 4,372 feet. This horizon is in the Morrison and appears to consist of sand with thin streaks of shale, making four sands that it has cut. It flowed 102 bbls. in the 24 hours ending Thursday morning. Same company's No. 5 Walter Wick, Section 10-4-92, is still being pumped from the Mowry shale above the Dakota at 4,165 feet. In the 24 hours ending Thursday morning it made 55 bbls., a drop from 140 bbls. the first day. As soon as the oil is exhausted, it will be carried on down. It oil is not found in the Dakota, it will be deepened to the Sundance. It is lower on the structure than wells that had water in the Dakota, but no showing of as large proportions in the shale.

In Rio Blanco County, the Texas Production Co.'s No. 2 Emerald, Section 31-2n-102, Rangely Dome, is bottomed at 3,815 feet and underreaming the 4¾-inch casing at 3,565 feet. It is in sand topped at 3,791 feet, supposed to be one of the Morrison series, and is making 4,000,000 feet of gas. At first this was thought to be the objective Sundance, a Morrison sand making gas having been drilled through. However, the logs of the wells on the Iles Dome has led to the conclusion that it has not yet reached the Sundance. The Midwest's No. 2 Rangely, Section 30-2n-102, is redrilling at 2,990 feet, with old bottom at 3,037 feet.

Tow Creek Field

In the Tow Creek Field, in Routt County, the Great Western Oil Co.'s No. 1 State, SE NW, Section 17-6n-86, had a small show of oil at 295 feet, the

What a Water Softener Will Do!

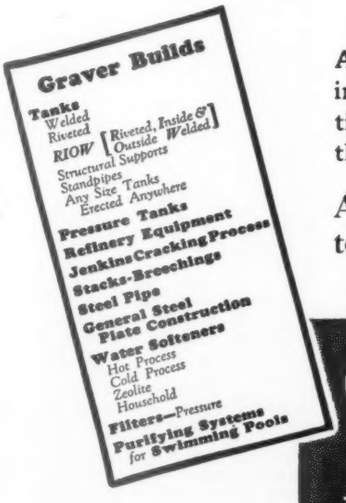
In Your Steam Power Plant

1. Allow your boilers to give their original designed capacity.
2. Eliminate tube renewals.
3. Keep boilers on stream continually.
4. Reduce fuel requirements.
5. Give you dry steam—no foaming or priming.
6. Reduce the number of boilers necessary for maintaining load.

In Your Natural Gasoline Plant

1. Give you maximum cooling in your coils greatly reducing investment for cooling equipment.
2. Allow your gas engine to function properly without overheating.
3. Stop continuous delays and shutdowns due to breakage caused by overheating.
4. Allow the use of any convenient water supply.
5. Eliminate the continual cleaning of coils.

THESE are just a few of the many savings from water softening. To secure the maximum results, it is necessary that the type of softening equipment be adapted to the requirements of each installation. For many years GRAVER Corporation has built all types of water softening equipment. Because of this and from the knowledge gained through long association with the oil industry GRAVER can recommend with assurance and without bias the correct type of softener for every use.



A GRAVER water softening plant will, in nearly every case, pay for itself in one year or less in tangible savings. The intangible savings (no loss of time—easier operation—less maintenance) are often of greater value than the tangible.

An experienced GRAVER water softening engineer will be glad to go over your water conditions with you.

GRAVER Corporation Founded 1857

EAST CHICAGO, INDIANA

NEW YORK Grand Cent. Term. | CHICAGO America Fore Bldg. | TULSA Atlas Life Bldg. | HOUSTON West Building

shallowest depth at which any shows have been found in this field. It is drilling below 300 feet. The Texas Production Co.'s No. 4 Adair, SE SE, Section 7-6n-86, topped the Frontier at 3,150 feet and has been drilled to 3,259 feet, finding water. It is being underreamed to 3,271 feet where the 6¼-inch will be set, and will be drilled deeper. Production from this pool all comes from the Mowry shale above the Dakota and all Dakota sand tests so far have been failures. This well, while not finding any oil in the shale, is running 262 feet higher than other Dakota sand tests, and it was decided to go on down. Several of the drilling wells on this structure are to be carried down to the new Sundance sand producing on the Iles Dome in Moffat County. Texas Production Co.'s No. 1 Rule, SW NE, Section 5-6-86, is underreaming with a total depth of 3,060 feet. Same company's No. 2 Edwards, SE SW, Section 8-6-86, is drilling in shale at 3,735 feet, and its No. 2 McNeill, NE SW, Section 5-6-86, is shut down at 3,410 feet. Same company's No. 4 Henry Dennis, NW NW, Section 17-6n-86, is running 10-inch casing at 1,170 feet.

In the Walden area in Jackson County, the Continental Oil Co.'s No. 1 Sherman, NW NW, Section 12-9n-79, which came in last December flowing oil that came from casing at a temperature of 110 degrees below zero, Fahrenheit scale, with a large flow of carbon dioxide gas, at a depth of 5,110 feet, is now making about 150 bbls. of oil and 30,000,000 feet of gas a day, the quality of the gas and oil showing no material change. The Continental has three wells drilling. Its No. 1 Hoye, SW NE, Section 34-9n-78, on the south structure, is running 10-inch casing at 2,780 feet. No. 1 Peterson, SW SW, Section 1-9n-79, on the north structure, is changing from rotary to cable tools at 3,635 feet. This well was drilled part of the way with cable tools and switched over to rotary, but the latter didn't prove satisfactory. Its No. 1 Pollock, SE SE, Section 2-9n-79, is fishing at 3,825 feet. Another well is being drilled in Jackson County by the Seivard Oil Co. in its No. 1 Hunter, SW NW, Section 31-11n-79, reported to be down 2,500 feet under a contract to drill to 3,500 feet.

Wellington Dome

In Larimer County, the Union Oil Co. of California is spudding at 75 feet in its No. 2 Foster, C NE SW, Section 30-10n-68, Wellington Dome. This is a joint operation with the Texas Production Co., and is one of the two wells drilling on this structure.

In Logan County, in the northeastern part of the state, the Northwestern Colorado Oil Co.'s No. 1 State, SW cor., Section 36-8n-55, Willard Dome, has resumed operations at 5,008 feet after a short shutdown to finance. The 4¾-inch casing is being run. The Dakota is expected within the next 200 to 300 feet.

In Las Animas County, near the New Mexico line in southeastern Colorado, the Parker Club's No. 1 Adams, Section 32-34-56, is bottomed at 3,535 feet in dark gray lime with occasional streaks of light blue shale. This formation has prevailed for more than 200 feet and the hole appears to be in the upper Pennsylvanian. Drilling was stopped for a day to move the furnace from the derrick floor and to take other precautionary measures as well is approaching the depth at which some results are expected. Already, it appears to have upset the theory that the red beds rested on the granite in that region. Foley & Goldsworthy's No. 1 Government, Section 11-30-60, is in dry hard quartz sand at 1,950 feet.

In Weld County, the Platte Valley Petroleum Co.'s No. 1 Patterson, Section 24-6n-61, Greasewood Dome, is running 6¼-inch casing at 3,300 feet to shut off water in the Hygiene sand topped at 3,200 feet.

In Arapahoe County, McDeb Drilling Co.'s No. 1 Fitzsimmons, Section 7-4s-66, is drilling in blue shale in a 10-inch hole at 2,500 feet.

In Montezuma County, the Cotton-Coon Syndicate's No. 1 Hall, Section 9-35-13, is drilling in shale at 600 feet. Dakota is expected at 1,200 feet.

In Boulder County, Repollo Oil Co.'s No. 1 Deines, Section 33-1n-70, south of old Boulder Field, made around 3 bbls. a day on the pump from the Hygiene sand at 3,400 feet after being plugged back from 4,730 feet. It has been shot with two quarts at 3,380 feet to crack the casing and production was increased by about 1 bbl. a day. Same company's No. 1 Nichols, Section 32-1n-70, is drilling below 1,800 feet.

New Mexico

The week's developments in New Mexico afforded little news outside of the routine of drilling operations. The Texas Production Co.'s No. 1 Rhoades, SE NE NW, Section 22-26-37, in the southeastern corner of Lea County, which topped a gas sand at 3,105 feet, and another at 3,130 feet, is being cemented and cleaned out and will be completed as a gas well. It gauged around 14,000,000 feet while the tools were lodged about 80 feet from the top. While no announcement has yet been made, it is probable that another test will be drilled in close proximity to this well.

The Texas Production Co.'s No. 1 Jackson, SE cor., Section 4-20-34, which went into sulphur water at 3,790 feet, the water rising 3,000 feet in the hole, was drilled on down to 4,010 feet, at which depth it is being plugged and abandoned. The log shows that the lime was topped at 3,630 feet, instead of 3,740 feet as at first reported. Same company's No. 1 Lockhart, SE cor. SW, Section 5-22-38, is drilling in red sandy formation at 3,380 feet. It was still in anhydrate at 3,225 feet. Inglefield & Bridges' No. 1 State, Section 4-17-34, has recovered tools lost at 5,048 feet, and is drilling in brown lime at 5,060 feet. The Maljamar Oil & Gas Co.'s No. 1 Beardsley, NE SE NE, Section 15-17-32, reached the base of the salt at 2,100 feet, and is now endeavoring to straighten a crooked hole. The total depth is 2,280 feet. Midwest Refining Co.'s No. 1 State, NE cor., Section 9-19-38, and the Bordages test No. 1 Hughes in Section 27-19-38, had not commenced spudding at last reports. The Exploration Co.'s No. 1 Record, Section 25-19-35, is still shut down at 4,005 feet.

In Eddy County, the Texas Production Co.'s No. 2 Robinson, NW cor. SW, Section 25-16-31, in the Maljamar area, is drilling at 1,550 feet. It had some water at 860 feet. The Skelly Oil Co.'s No. 1 Beulah Lynch, Section 22-17-31, has succeeded in cleaning hole of parted casing and has plugged back to 3,811 feet to test the horizon at 3,792-3,800 feet. This horizon will be shot. George F. Getty, Inc.'s No. 1 Lenau, NW cor., Section 33-22-27, is shut down in lime at 3,040 feet, waiting for orders. At 2,970 feet it had 2,600 feet of water in it.

Artesia District

In the Artesia District, the Pueblo Oil Co.'s No. 2 Yates, SW cor. SE, Section 33-17-28, is drilling at 360 feet, and Levers & Carper's No. 5 State, SW SE NW, Section 3-18-28, is spudding. Pueblo Oil Co.'s No. 1 Gessert, NE NW, Section 1-17-31, Eddy County, is drilling at 1,625 feet. It topped the salt at 917 feet.

In Chaves County, the Texas Production Co.'s No. 1 Wilson, SW, Section 29-17-18, Dunken Dome, is drilling in white lime at 4,760 feet, and McQuigg & McQuigg's No. 1 Neis, NW cor., Section 7-5-29, is rigged up and waiting for engine. The Arena Oil Co.'s No. 1 Wilkerson, NW, Section 18-13-31, is drilling by tools lost at 750 feet. These are the only active operations in the county, the other wildcats being shut down.

In Curry County, the only drilling well is the Clovis Oil & Gas Co.'s No. 1 Haskins, C NE, Section 21-3-36, which is drilling at 3,125 feet.

In Torrance County, the Bluhall Oil Co.'s No. 1, Section 7-4n-10e, is spudding at 90 feet.

In San Juan County, interest at present is cemented on the Huntington Park Oil Co.'s No. 1 Terwilliger, Section 29-30-9, in the Blanco district. Late reports are to the effect that the hole is bottomed at 4,025 feet and is making a small show of oil. It probably is entering the top of the Mesa Verde series. This well had a small production in the Farmington series at 1,645 feet. It looks as if the Dakota at this location will be too deep for the drill, and the fate of the well will depend on what is found in the Mesa Verde, which is productive in a test well drilled by the Midwest Refining Co. on the Hospah Dome in McKinley County.

Towns to Get Gas

The T. C. N. Oil Co., which recently completed a gas well good for 1,500,000 feet in its No. 1 Lanier, NW cor. SW, Section 9-29-11, at 916 feet, has made a deal with the town of Aztec to furnish it with natural gas for domestic purposes. The company was given a week in which to buy pipe for a 5-mile line to connect with a line now extending half a mile south of the town, and 30 days in which to have the gas in the line. At the same time it was given a 30 day option to buy the distributing system owned by the Aztec Oil Syndicate. The company also has been dickering with the town authorities of Farmington and has been given a 45 days option on a franchise in which to make surveys and estimates of cost and to show its ability to carry out the project. This deal will require the piping of Farmington to serve domestic consumers. The company is starting its No. 2 Lanier, 500 feet northeast of No. 1, in Section 9-29-11.

Kane Brothers' No. 1, Section 15-29-11, Bloomfield district, in San Juan County, had a show at 730 feet, but it was not commercial, and the hole is being carried deeper. The Union Oil & Mining Co.'s No. 2 Pine, Section 8-29-9, Blanco district, which has been bottomed for some time at 2,950 feet with three strings of tools in the hole, has installed heavier equipment and is preparing to sidetrack the tools. This test has had a show of oil and gas ever since the present horizon was reached nearly a year ago, and recently when it was opened up, the gas pressure forced about 40 bbls. of oil over the top. On the Rattlesnake Dome, the Continental Oil Co.'s No. 17 Munoz, Section 2-29-19, has redrilled to 3,503 feet and still has more than 250 feet to go to reach the old bottom.

In McKinley County, the Midwest Refining Co.'s No. 1 Hancock, Section 1-17-9, has been plugged back to a productive sand in the Mesa Verde at 1,561 feet and was put on the pump on October 5, but no report has yet been received as to what it is making. A test at the time the oil was encountered showed 244 bbls. in 24 hours. It was then cased off for a test to the Dakota in which water was found. The Continental Oil Co.'s No. 1 Carica, Section 9-17-7, Carica Dome, is bottomed at 1,600 feet and drilling. S. Dysart, and others' No. 1, Section 21-14-9, is drilling below 1,510 feet. A show of oil was encountered at 1,420 feet, followed by water at 1,450 feet, the water rising 1,000 feet in the hole. The Ohio Oil Co. is starting another test in McKinley County in its No. 1 Nightingale, Section 25-17-6w, and is drilling at 700 feet.

Utah

Oil operations in Utah have slowed down materially in recent weeks and only a few wells are drilling. The Phillips Petroleum Co. has shipped a rig into Utah for its test on one of the structures in the Nequoia Arch country, but no decision has yet been made as to which of the several structures will be tested. Another well to resume shortly is Early No. 1, SE SW, Section 13-4s-6w, in Duchesne County, which will be drilled by the Midwest Exploration Co. under a contract with 62 others, to a depth of 3,500 feet. It has been shut down for some time at 2,867 feet. It will test the Green River formation of the Tertiary, and geological reports show seven sands that will be tested within the contract depth.

The Midwest Exploration Co.'s No. 1 Hughes, Section 30-34-19, Elk Ridge Dome, is entering its final stages. At present it is bottomed at 4,090 feet in sand with a fishing job on hand. It encountered sand at 4,035 feet, the sand being dry except at 4,055-60 feet from which horizon it made about 1 bbl. of water per hour. This appears to be the

(Continued on Page 161)

IMPERIAL OIL, LTD., WILL TEST SKIFF FIELD, SOUTHERN ALBERTA

By Victor Lauriston
Staff Correspondent, Canadian Fields

CHATHAM, Ontario, Oct. 15.—Announcement has been made from the head office of Imperial Oil, Ltd., at Toronto of an arrangement whereby the Skiff Field in southern Alberta, opened some months ago by the drilling of Devenish Petroleum's No. 1, will be thoroughly tested by Imperial Oil, Ltd. Under the agreement it is understood that 10 tests at least will be drilled by Imperial Oil, Ltd., the work to begin as soon as the deepening of Devenish Petroleum's No. 1 is finished. It is understood that the contract with Imperial Oil, Ltd., calls for the transfer to the Imperial of 75,000 shares of Devenish stock for every well drilled to a level corresponding with that of the discovery well. Thus the drilling of 10 wells will give Imperial Oil, Ltd., control of the Devenish company. The authorized capitalization of Devenish Petroleum, Ltd., is 1,500,000 no-par shares, and of these approximately 720,000 shares have been issued to independent shareholders, leaving some 780,000 shares of treasury stock. Devenish Petroleum, Ltd., holds 60,000 acres in the Skiff Field and 14,000 acres on the nearby Verdigris Coulee structure. The latter is to be tested by Commonwealth Petroleum, Ltd., on a royalty basis.

Has Good Production

Devenish Petroleum's No. 1, LSD 5, Section 27-5-14w4, started drilling in 1926 and shortly after resuming last spring encountered oil at 3,090 feet. Swabbing operations indicated an initial production of 250 bbls. a day, and some shipments were made to the Imperial Oil, Ltd., refinery at Calgary. The crude tested a little better than 20 degrees Baume. Later, swabbing was discontinued and it was decided to deepen the well to the Madison limestone. It is stated that shortly before drilling was resumed the gas pressure had increased sufficiently to flow the oil, and that with a gas lift the production might be increased to 500 bbls. a day. The crude is coming from an upper member of the Ellis sand. It is estimated that the top of the Madison limestone is around 3,200 feet, so that a few hundred more feet of drilling should be sufficient to complete the deep test. If production is not secured in the lower horizons, the well will be finished in the Ellis.

Shortly after the deepening of the test was commenced, casing trouble was experienced when the drill was at 3,150 feet depth. The 6¾-inch casing parted and a protracted fishing job resulted. The lost casing was recovered a few days ago and is being again connected after which the deepening of the well will be resumed.

Following the agreement between Imperial Oil, Ltd., and Devenish Petroleum, Ltd., considerable filing was done in the Lethbridge land office on acreage in the Manyberries district, by interests believed to represent Imperial Oil, Ltd. The acreage covered lies east of the Pakowki Lake area where some years ago C. P. Thompson and associates of New York drilled an unsuccessful deep test in Township 5-5w4. The structure is thought to be related to the general series of folds composing the Cypress Hills structure further to the north and east.

Turner Valley Field

In the Turner Valley Field, southwest of Calgary, New McDougall-Segur's No. 2, LSD 14, Section 12-20-3w5, is reported a commercial producer in the Dakota sand at 2,646 feet depth.

(Continued on Page 146)

Decline in California Output Expected

Estimate of 610,000 Bbls. Daily by End of Year Based on Curves. Ventura Avenue Gas Conservation a Factor

By L. P. Stockman
Staff Correspondent, California Fields

LOS ANGELES, Calif., Oct. 17.—Decline curves indicate that California's crude oil production at the close of the current year should approximate 610,000 bbls. daily, a drop of about 20,000 bbls. in a little less than three months' time. That there is many a slip between prognostication and fulfillment, however, is evidenced by the fact that developments during the past few weeks indicate that state production may possibly drop below this figure before the new year rolls around. This is not due to any miscalculation but can be attributed to one of the many factors which affect production estimates from time to time but which cannot be foreseen or taken into consideration in advance. So far everything has run according to schedule and original estimates that state production would approximate 610,000 bbls. daily at the close of the year still look good as far as the normal decline is concerned. The Alamitos Heights town lot section of the Seal Beach Field went over the top during the last week in September as was predicted by the writer several weeks in advance and the decline since that time has removed all doubt as to the future tendencies of this area. During the early part of September attention was directed on several occasions to preliminary indications of gas depletion always a forerunner of smaller production and for this reason the drop which has occurred at Alamitos Heights did not come as a surprise.

Ventura Avenue Situation

The factor mentioned above which may upset carefully prepared estimates of future production is the possibility of another shut in at Ventura Avenue where strenuous efforts are being made to prevent further unnecessary waste of wet natural gas, about 50,000,000 feet of which have been allowed to blow off into the air because of inadequate facilities.

The Ventura Conservation Board has been battling with this vexing problem for over a month and although wastage has already been reduced by about 10,000,000 feet daily there is still room for considerable improvement. The various operators in this field are practically unanimous in agreeing that corrective steps should be taken to reduce all economic waste but there is a divergence of opinion as to how it should be accomplished. In view of the progress made to date, however, it seems quite likely that definite steps will be taken to curtail further gas waste within the next two weeks. Considerable study has been given to the situation in order that no unnecessary curtailment of crude oil production will result from the restriction of natural gas production. The affinity existing between these two basic commodities, however, makes it exceedingly hard to outline a definite concrete basis of work as the factors involved are variable and fluctuate from day to day. The shutting down of one well for instance many times results in an abnormally high gas-oil ratio in the offset. It is problems such as this which have been holding up work for the past month but with the experience already gained operators will be able to work out an equitable basis of curtailment.

It has not yet been decided just how much crude oil production will have to be shut in to affect the desired reduction in natural gas production but it may run anywhere from 1 to 10,000 bbls. per day. No definite time limit has been set for the inauguration of this conservation work but it would not be surprising if it got under way on or about November 1.

Long Beach may offset the artificial decline at Ventura Avenue to some extent as this field is again coming into its own because of increased drilling. When the Alamitos Heights town lot area at Seal Beach was opened up for work the influx of operators to that area resulted in a reduction of work in many other fields. This is just what happened at Long Beach but now that Alamitos Heights is on the down grade operators are again turning to the former. This resumption of activities at Long Beach will undoubtedly result in an increase in production. Most of the new wells getting under way have the deep sand as their objective and, while this class of work will not begin to manifest itself for two or three months the intervening period will witness the recompletion of several former upper zone producers in the lower horizon. Some are inclined to believe that Long Beach daily production as a result of this deepening work will again approach the 100,000-bbl. mark within the next several months. The grease is there and it is only a question of how much they want.

Seal Beach

Completions in the Seal Beach Field during the past week were fairly numerous, although, with one or two exceptions, the initial production was consistently smaller than heretofore. The production trend of the entire field continues downward and will continue to do so from now on as drilling operations are getting smaller from time to time. Petroleum Securities finished three wells during the past week, two of which were recompletions after being carried down to the lower sand. These were No. 6 Naples, which came in flowing 410 bbls. daily from 5,360 feet, and No. 5 on Bryant Lease "A", which resulted in a 100-bbl. pumper from the 5,425-foot level. No. 1 Geick, the new well finished by this company, and incidentally the smallest, started off pumping 85 bbls. daily from 5,395 feet. The Pan American and Petroleum Securities, both Doheny companies, see.ng the inevitable, began cutting down their drilling operations several weeks ago and although these concerns, which are working on a 50-50 basis, still have 18 uncompleted projects under way in the town lot area all of them are former producers being carried down to the deeper sand. The California Eastern recompleted No. 1 Ostaff during the early part of the week after plugging back from 5,505 feet to 5,475 feet because of bottom water. This recompletion in the deep sand came in under a natural flow doing 900 bbls. during the initial 24-hour test but declined the next day to 575 bbls., the present cut running slightly in excess of 3 per cent. This company has four other potential producers nearing completion, two of which, No. 2 Judson and No. 1 Parr, should be completed shortly.

Marland Oil Co., discoverer of the Seal Beach Field, has just closed a rather busy week, during which time the company brought in two producers on the Selover property and concluded drilling operations on two more. The company's new wells were Nos. 15 and 16, both of which were recompletions after being redrilled and deepened to the lower horizon. The former tanked 2,025 bbls. during the first 24-hour test from 5,575 feet, while the latter started off producing 1,125 bbls. from 5,570 feet. Both wells are flowing through seven-eighths-inch beans and yielding an exceptionally clean 28.2 gravity oil. The Associated's No. 10 Bryant, a new well in the extreme eastern part of the old field, in contrast to the large production secured by the Marland, only registered an initial of 300 bbls. daily when put on a compressor from the 4,528-foot level. George F. Getty recompleted two former Selover zone producers during the week after redrilling and deepening them to the lower sand but neither showed any exceptional prolific tendencies. No. 8 tanked 485 bbls. daily from 5,474 feet while No. 12 produced 650 bbls. during the initial 24-hour test from 5,476 feet. Both wells, which are producing fairly clean 28.4 gravity oil, were put on compressors. Getty's next completion in the town lot area will probably be No. 13 Alamitos, which is at present rotating ahead in the oil sand at 5,400 feet.

The Superior Oil Co. recompleted No. 1 on fee lease No. 1 at 5,340 feet after plugging off the bottom 8 feet of hole and it started off flowing at the rate of 500 bbls. daily but settled a short time later to 350 bbls. The drop in production was

IMPORTANT SOUTHERN CALIFORNIA WILDCATS

Company, well, location—	S-T-R	Depth	Status
Cal. Eastern, No. 1 Cypress, Potrero	27- 3-14	5,043	suspended
Associated, No. 1 Cypress, Potrero	34- 2-14	4,620	gr. sd. drilling
Hearst & Thompson, No. 1 Inglewood	28- 2-14	Rig	rigging up
Mont. Park Oil Co., No. 1 Browning, Monterey Park	26- 1-12	2,190	hd. sd. drilling
Circle Oil Co., No. 1 Pomeroy, Manchester	23- 3-14	4,280	suspended
Shell, No. 1 Mission, San Fernando	4- 2-15	4,291	hd. sd. drilling
Sou. Calif. Drlg. Co., No. 1 Matteson, El Segundo	1- 3-15	4,870	plug back
Carr, O. P., No. 2 Foster, San Juan Capistrano	13- 8- 8	3,990	hd. sd. drilling
Thomason & McCoy, No. 1 Rinz Saugus	27- 5-16	1,610	suspended
Southwest Pet., No. 1 Ramsauer, Watts	4- 3-13	3,871	hd. sd. drilling
San Clemente Oil Co., No. 1 Peck, Hawthorne	30- 3-14	4,900	gr. sd. drilling
O'Donnell, J. E., No. 1 Dupree, Hawthorne	29- 3-14	4,000	gr. sd. drilling
White Behr, No. 1 Watson, L. A. County	21- 4-14	105	sd. drilling
Shell, No. 1 Allec, Placentia	31- 3- 9	4,250	hd. sd. drilling
Standard, No. 1 Olive, Orange Co.	17- 4- 9	4,150	hd. sd. drilling
Son. C. A., No. 1 Pinkerton, Orange Co.	5- 5-11	2,590	gr. sd. drilling
Ohio Oil Co., No. 1 Bolsa Dome, Orange Co.	35- 5-11	Rig	rigging up
Stein, Leo, No. 1 Long, Orange Co.	21- 5-11	2,595	fair showing
Standard, No. 1 Rindge, Palms	36- 1-15	Rig	in litigation
Hemet Pet. Co., No. 1 Ward, Riverside Co.	9- 5- 1	1,408	suspended
Anchor Oil Co., No. 1 Hudson, Los Angeles Co.	19- 2-10	1,918	sd. drilling
Pet. Securities, No. 1 Newport, Orange	3- 6-10	Rig	rigging up

IMPORTANT NORTHERN CALIFORNIA WILDCATS

Associated, No. 1 Smith,, Kettleman Hills	12-23-18	2,043	suspended
Bolsa Chica, Well No. 1, Kettleman Hills	30-23-19	3,500	sd. sh. drilling
General Pet., No. 1 Burbank, Kettleman Hills	30-23-19	3,105	pipe bad
General Pet., No. 2 Oschener, Kettleman Hills	26-22-18	4,790	reaming
General Pet., No. 1 Dome, Kettleman Hills	4-24-19	3,800	fishing
C. C. M. O., No. 1 McGlashan, Kettleman Hills	17-24-19	5,010	fishing
South Coalinga, Well No. 1, Kettleman Hills	35-24-19	2,903	sd. sh. drilling
McPhail, Hugh, Well No. 1, Kettleman Hills	13-24-18	2,160	hd. sd. drilling
Superior Oil Co., Well No. 1, Kettleman Hills	26-21-17	3,760	bl. sh. drilling
Milham Expltn., No. 1 Kettleman, Kings Co.	2-22-17	4,671	hd. sd. drilling
Shell, No. 2 Berlywood, Moorpark	32- 3-20	5,440	hd. sd. drilling
C. C. M. O., No. 1 Hobson, Ventura Co.	22- 3-24	6,997	oil sand
C. C. M. O., No. 1-B Hobson, Ventura Co.	16- 3-24	5,560	oil sand
Pan American, No. 1 State, Ventura Co.	17- 3-24	3,162	good oil sand
Pan American, No. 1 U. S., Ventura Co.	17- 3-24	Rig	suspended
Scott Petroleum, No. 1 Surf, Ventura Co.	35- 4-24	601	sd. drilling
Continental Oil Co., No. 1 Burnham, Ventura Co.	22- 5-18	3,176	gr. sd. drilling
Standard, No. 1 Camarillo, Ventura Co.	29- 2-20	5,590	fishing
Petroleum Sec., No. 1 Diablo, Ventura Co.	26- 5-18	3,300	gr. sd. drilling
Parkford, E. A., No. 1 Strathern, Ventura Co.	5- 2-18	3,855	br. sh. drilling
Shell, No. 1 Strathern, Ventura Co.	6- 2-18	Mtl.	building rig
Geiss & Bradford, No. 1 Sulphur Mtn., Ventura	21- 4-22	1,997	testing
Star Petroleum, No. 1 Canet, Ventura Co.	13- 3-23	5,240	fishing
Miley Oil Co., No. 1 Red Mountain, Ventura Co.	7- 3-23	800	sd. drilling
Richfield, No. 27 Piru, Ventura Co.	35- 5-18	1,902	suspended
Milham Explrn., No. 2 Buttonwillow, Kern Co.	8-28-23	4,662	gas well
Milham Explrn., No. 3 Buttonwillow, Kern Co.	7-29-24	4,150	clean ng out
Pacific Eastern, No. 1 Fruitvale, Kern Co.	21-29-27	Rig	rigging up
Pacific Eastern, No. 1 Bakersfield, Kern Co.	6-30-28	4,503	deepening
General Pet., No. 1 Edison, Kern Co.	5-30-29	2,850	sd. sh. drilling
Shell, No. 1 Mon Bluff, Kern Co.	3-28-28	2,860	sd. drilling
Kerwin & Seal, No. 1 Edison, Kern Co.	4-30-29	Rig	suspended
Getty, George F., No. 1 Edison, Kern Co.	22-29-29	2,513	br. sh. drilling
Mays & Valencia, No. 1 Greenfield, Kern Co.	31-30-28	Rig	rigging up
C. C. M. O., No. 1 Quinn, Delano	23-25-27	2,281	plug back
North American, No. 1 Wallace, Delano	5-25-26	2,405	sd. drilling
Sayers, R. H., No. 1 Poso, Kern Co.	7-26-18	Rig	rigging up
Fresno Madera Oil Co., No. 1 Clovis, Fresno Co.	18-12-21	3,825	hd. sd. drilling
Richfield, No. 1 Wreden, San Luis Obispo Co.	10-29-17	1,100	sd. drilling
Shell, No. 1 Cowell, San Mateo Co.	8- 6- 5	4,781	sd. sh. drilling
Shell, No. 1 Murphy, Petaluma	29- 5- 6	6,360	hd. sd. drilling
Shell, No. 2 Murphy, Petaluma	8- 5- 6	1,800	hd. sd. drilling
Thomas & Hammill, Well No. 1 Alemeda Co.	16- 3- 3	1,425	hd. sd. drilling
Elliott & Clarke, No. 1 Marcos, Santa Barbara Co.	3- 6-29	2,359	hd. sd. drilling
Becker, Geo. F., No. 1 Summerland, Santa Barbara	33- 4-25	3,050	testing
Birch Oil Co., No. 1 Porterville, Tulare Co.	13-20-26	2,041	fishing
Union Oil Co., No. 1 Huasna, San Luis Obispo	26-32-15	....	location

TANKER SHIPMENTS FROM LOS ANGELES TO ATLANTIC AND GULF COAST PORTS

Commodity—	Total This Week	Daily Average	Total Last Week	Daily Average	This Year to Date	Same Time Last Year
Crude oil	.....	.....	278,676	39,811	7,703,480	9,402,461
Fuel oil	138,408	19,773	264,683	37,812	6,356,553	5,386,278
Diesel and gas oil	78,413	11,202	.....	.....	2,228,626	2,453,148
Gasoline	193,919	27,703	160,584	22,941	6,906,173	5,242,503
Tops	.....	.....	.....	.....	.....	302,347
Coastwise—						
Crude oil	298,823	42,690	520,726	74,369	19,624,688	18,616,810
Fuel oil	285,337	40,762	564,846	80,692	9,768,623	8,399,439
Diesel and gas oil	20,661	2,952	.....	.....	317,987	147,411
Gasoline	374,064	53,438	210,694	30,099	7,301,979	5,601,233
Kerosene	3,611	516	4,820	689	155,649	151,772
Tops	.....	.....	.....	.....	104,595	501,520
Exports—						
Crude oil	.....	.....	74,773	10,682	1,958,308	3,432,631
Fuel oil	389,946	55,707	720,659	102,951	21,138,524	13,432,147
Diesel and gas oil	28,902	4,129	34,914	4,988	992,738	370,892
Gasoline	234,889	33,556	91,951	13,136	3,805,632	2,595,705
Tops	.....	.....	.....	.....	227,204	70,415
Kerosene	.....	.....	.....	.....	1,551,344	2,292,957

TANKER SHIPMENTS FROM SAN FRANCISCO TO ATLANTIC, GULF COAST PORTS

Fuel oil	.....	.....	.....	.....	.....	78,653
Diesel and gas oil	.....	.....	.....	.....	597,158	1,450,502
Gasoline	80,354	11,479	113,916	16,274	1,612,975	853,312
Tops	.....	.....	.....	.....	.....	73,698
Lubricants	.....	.....	.....	.....	303,618	250,010
Coastwise—						
Fuel oil	77,753	11,108	7,728	1,104	4,126,397	4,222,967
Diesel and gas oil	.....	.....	.....	.....	207,012	.....
Gasoline	190,236	27,177	23,513	3,359	4,115,001	3,743,082
Kerosene	29,418	4,203	.....	.....	191,008	294,649
Exports—						
Fuel oil	.....	.....	45,950	6,564	2,178,702	2,725,147
Gasoline	.....	.....	.....	.....	2,215,261	1,499,042
Kerosene	.....	.....	.....	.....	654,079	1,537,597
Lubricants	....	.....	.....	.....	18,370	36,810

offset to some extent, however, by an improvement in the quality of oil produced as the cut dropped during this period from 3 per cent to less than 1 per cent. The Universal Consolidated recompleted No. 1 Judson in the lower zone at 5,481 feet but the initial production, 495 bbls. daily, is cutting in excess of 30 per cent. This hole is drawing from 420 feet of oil sand but will probably be plugged back as it is apparent that botton water has been encountered. Walklin & Peacock's No. 1 Alamitos, while not an exceptionally large producer, is yielding an unusually clean 29.0 gravity oil. It is flowing through a fifty-sixty-fourth-inch bean under a pressure of 400 pounds and tanked 715 bbls. during the initial test from the Wasem zone at 5,500 feet. One of the most interesting wells in the Seal Beach Field at the present time is perhaps the Standard's No. 13 San Gabriel, located between the old field and the town lot extension. The importance of this well lies in the fact that it will define the productive limits of the intervening territory between these two sections of the field. It was down 5,900 feet a few days ago, considerably below the depth at which production is secured in the town lot area and, while the failure to develop commercial production was somewhat disappointing, it is really not surprising in view of the fact that the well is located further north than the anticipated outer limits of the field at this point.

Long Beach

The past week witnessed the completion of another large deep sand flowing well in the Long Beach Field and, judging by developments already under way, this district will witness a revival of drilling operations during the course of the next several months. The California Petroleum Corp.'s No. 6 Davidson, a new well, was the instrumentality through which this field has again been brought into the limelight. This well was an exceptionally prolific one doing 2,029 bbls. of clean 30.3 gravity oil daily but its chief claim to distinction did not lie alone in the initial production attained as its depth, 5,671 feet, was also of unusual interest. Operators have been intermittently developing the deep sand down around the 5,500-foot level but will probably take a larger penetration from now on. No. 6 Davidson has approximately 550 feet of oil sand from which to draw and this favorable penetration presages long lived production. The California Petroleum has already started deepening operations on two other wells, No. 1 Griswold and No. 2 Walker, both of which will be carried down to the lower horizon at once. No. 2 Schilling will also get under way soon as the company erected a rig for this project some time ago.

The Pan American's No. 3 Chainey, another deep zone well, will undoubtedly be watched with considerable interest during the course of the next 30 days, as this hole will be considerably deeper upon completion than No. 6 Davidson of the California Petroleum. The Richfield Oil Co. has started deepening operations on a rather large scale and with six wells already under way the outlook for increased production is exceptionally bright. Four of these are on the Booth and Freeman properties acquired as a result of the Delaney-San Martinez transaction, which was consummated a few months ago. The Richfield's most important well at the present time is No. 8 Booth, which was drilling ahead a few days ago at 5,550 feet. Two new wells were also spudded in during the past week and both of them will have the deep sand as their objective. In addition to the new work started the Richfield listed three wells for abandonment. These were No. 7 in Section 13-4-13 and Nos. 1 and 2 on the Taylor lease. George W. Johnson, who recently negotiated a lease with the Crest Oil Co. for lower zone production, started work on No. 3 Crest, a direct offset to the Shell's discovery, No. 1 Alamitos. Another new well started during the current week was No. 3 Crew of the Superior, one of two deep tests which this company will drill at Long Beach. The Shell had just previously spudded in No. 24 Alamitos and thus has a handicap of about 1,500 feet over Johnson and the Superior. The A. T. Jergins Trust recompleted No. 7 Municipal during the early part of the week after plugging back from 5,454 feet to 5,130 feet, but the result was not satisfactory as the present production, 135 bbls. daily, is cutting approximately 35 per cent water and will therefore require corrective work. The Union had better luck as its No. 15 Long Beach Community, a new well, which came in under a natural flow doing 590 bbls. of clean 26.8 gravity oil daily from 4,306 feet.

Huntington Beach

There were quite a number of new wells and recompletions finished in the Huntington Beach Field during the past week but all of them registered small production. The Standard headed the list with two new producers on the Pacific Electric property, which parallels the ocean front in the town lot area. The smallest was No. 15, the most easterly of this group of wells as it only showed 115 bbls. daily from 3,920 feet, as compared with an initial of 140 bbls. daily from No. 13, which was finished at 3,820 feet. The completion of these two new wells leaves the Standard with one uncompleted drilling project on this lease, although the company is running two or three strings of tools in the older section of the field. The Crudoil Co.'s No. 8 Huntington, a recompletion at 4,454 feet, was the largest well brought in during the week as it started off doing 220 bbls. daily from a penetration of 142 feet in the oil sand. The new wells have just been finished in a shallow sand and as would naturally be expected, both showed small production of heavy oil. Allen Brown's No. 1 Huntington was good for 165 bbls. daily from 2,197 feet and the South Basin Oil Co.'s No. 2 Dabney, 75 bbls. daily from 2,150 feet, the oil in each case testing 15.1 degrees. This heavy oil is quite eagerly sought as it contains an excellent cold test lub stock.

The Coast Line's No. 1 Huntington only showed an initial daily production of 105 bbls. from 4,348 feet but this small output is no doubt due to the fact that a satisfactory water shut off had not been effected. Young & Lunberg's No. 1 Ames, a new well, was also a disappointment upon completion as it only showed an initial of 25 bbls. daily from 4,432 feet. The Standard finished a new well in the Inglewood Field during the week and boosted its daily production 260 bbls. The company's latest completion was No. 54 Baldwin, drilled to 2,044 feet and finished with a 9-inch oil string carrying 570 feet of 100-pound reinforced screen.

Richfield-Brea Olinda

Development work in the Richfield district continued at a normal rate and drilling operations resulted in the completion of two new wells during the week and, judging by present indications, several more can be expected in the near future. The Chanslor-Canfield Midway Oil Co. brought in No. 7 Richfield as a 115-bbl. pumper from 4,553 feet, the hole having been finished with a 6¼-inch oil string carrying 385 feet of 130 mesh screen. The General Petroleum, Associated, California Petroleum and Standard are all expected to list at least one new well within the next 30 days. Featherstone & Present picked up the oil sand in their No. 6 at 4,100 feet and this well should be tanking oil within the next 10 days. The Union brought in No. 16 Yorba Linda Group at Richfield during the past week and this new well, which came in doing 220 bbls. from 3,250 feet, will be followed into production by two or three more within the next 14 days. At Brea Olinda the Union completed No. 69 Stearns, flowing 550 bbls. of clean 26.1 gravity oil daily from the 4,900-foot level. No. 3 on the Olinda property, however, is not showing up as well as might be expected and the outlook for deep production at 5,324 feet is rather discouraging. The Shell's deep test in this field, No. 40 Columbia, has just passed the 7,035-foot level with no important showings logged for the past 1,000 feet.

Ventura

The possibility of another curtailment in crude oil production at Ventura Avenue as a result of a concerted move to restrict natural gas production to a minimum has brought this district into the limelight again and while the next shut in will not be as severe as that inaugurated on May 1 last, it will nevertheless result in a substantial decline in field production if present negotiations are brought to a successful conclusion. The economic waste resulting from excess production of natural gas at Ventura can be overcome in two ways, but one, the augmenting of present facilities, is out of the question in as much as it would require several months to complete additional installations. The only chance therefore of bringing natural gas production down to the point where it can be handled with a minimum of waste is to pinch in wells showing an excessively high gas-oil ratio. It remains to be seen just what method will be pursued but at the present time it looks as though several wells will be pinched in pending the erection of additional casinghead plants.

One of the most interesting developments in the field from a drilling standpoint was the spudding in of No. 102 Lloyd by the Associated a short time ago and work on this well will no doubt be watched very closely. The importance of this hole lies in the fact that it is one location north of No. 101 Lloyd down in Halls Canyon in the extreme eastern part of the Ventura Avenue Field. No. 101, it will be recalled, developed an extremely high gas pressure upon completion in March of last year and the company, instead of erecting tanks adjacent to the well, merely extended the flow line up over the hill to the tank farm, resulting in an additional lift of approximately 700 feet.

It is rather surprising to note the increase in drilling operations lately in view of the present gas conservation work under way as the completion of these holes will naturally augment the production of wet gas. Fifteen tests have been started in this field during the past 30 days and, while a few of them have not yet actually been spudded in, they are expected to get under way in the near future. This new work is general throughout the field although the Associated and Shell are responsible for most of it. The General Petroleum has practically completed its drilling program in this district, although the company still has a few undrilled locations yet available. The Petroleum Securities is running five strings of tools at the present time on the Willett and Orton leases and hence should list another new well or two within the next 30 days.

Goleta

When the Barnsdall Oil Co., under the personal direction of R. A. Broomfield, finished its No. 1 Edwards at Goleta about 15 miles west of Santa Barbara, operators began wondering if the company had opened up a new field or whether the old field had been extended 2 miles westward. The quality of the oil produced in each section is practically the same, although the Barnsdall's new producer, which came in doing 400 bbls. daily, was finished at 2,485 feet, considerably deeper than the point at which the Miley Oil Co. found production on the Tecolote lease. It is the general consensus of opinion that the Barnsdall has opened up another productive area as the original Goleta Field, discovered by Miley, appears to have perfect closure east of the Edwards lease. If this is true, the Barnsdall is sitting on top of the world as it controls approximately 1,500 acres surrounding its new well. E. J. Miley has a lease adjoining the Barnsdall's holdings on the north, while the Doheny interests control several hundred acres to the east. This extension work, or new discovery by the Barnsdall has revived interest in the Cal-American Holding Corp.'s wildcat on the Parks ranch about 7 miles west of the Barnsdall. This well, incidentally is expected to get under way within the next 15 days as material and equipment have already been ordered. In the original Goleta Field, Miley's deep test, No. 1 Tecolote, is still in search of the elusive deep sand and at 5,460 feet the outlook is rather discouraging.

Kern River

Three new wells were finished on the Kern River front during the past week, one of which, the General Petroleum's No. 13 Sill, resulted in exceptionally large production. This new well, located in Section 26-28-27, came in doing 398 bbls. of 14.1 gravity oil daily from 2,229 feet, the hole having been finished

(Continued on Page 145)

RECEIPTS OF CALIFORNIA OILS AND IMPORTS OF PETROLEUM

Receipts of California crude and refined oils at Atlantic and Gulf Coast ports for the month of September totaled 3,465,000 bbls., a daily average of 115,500 bbls., compared with 3,426,000 bbls., a daily average of 110,516 bbls., for the month of August.

Receipts at Atlantic and Gulf Coast ports for the week ended October 8 totaled 755,000 bbls., a daily average of 107,857 bbls., against 907,000 bbls., a daily average of 129,571 bbls. for the week ended October 1.

	Total month September	Total month August	Week ended October 8	Week ended October 1
At Atlantic Coast ports:				
Baltimore	691,000	574,000	.....	249,000
Boston	209,000	95,000	135,000	92,000
New York	1,542,000	1,492,000	458,000	378,000
Philadelphia	437,000	537,000	72,000	80,000
Others	586,000	*728,000	90,000	907,000
Total	3,465,000	3,426,000	755,000	907,000
Daily average	115,500	110,516	107,857	129,571
Distribution of total California receipts is as follows:				
Crude	1,227,000	*1,530,000	164,000	233,000
Gasoline	1,235,000	1,155,000	207,000	227,000
Gas oil	372,000	237,000	166,000	223,000
Fuel oil	631,000	504,000	218,000	224,000
Total	3,465,000	3,426,000	755,000	907,000

*Revised.

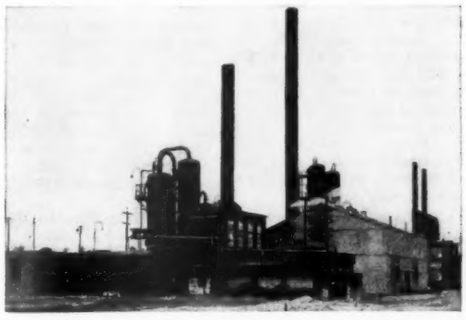
According to figures collected by the American Petroleum Institute, imports of crude and refined oils at the principal ports for the month of September totaled 6,119,000 bbls., a daily average of 203,967 bbls., compared with 5,619,000 bbls., a daily average of 181,258 bbls. for the month of August.

Imports at the principal United States ports for the week ended October 8 totaled 902,000 bbls., a daily average of 128,857 bbls., compared with 1,463,000 bbls., a daily average of 209,000 bbls. for the week ended October 1.

	Total month September	Total month August	Week ended October 8	Week ended October 1
At Atlantic Coast ports:				
Baltimore	841,000	599,000	95,000	206,000
Boston	343,000	280,000	65,000	145,000
New York	2,565,000	2,508,000	353,000	625,000
Philadelphia	384,000	442,000	.....	141,000
Others	1,131,000	1,069,000	217,000	*159,000
Total	5,264,000	4,898,000	730,000	1,276,000
Daily average	175,467	158,000	104,286	182,286
At Gulf Coast ports:				
Galveston district	170,000	65,000	.....	40,000
New Orleans and Baton Rouge	577,000	656,000	123,000	147,000
Tampa	108,000	.....	49,000	.....
Total	855,000	721,000	172,000	187,000
Daily average	28,500	23,258	24,571	26,714
At all United States ports:				
Total	6,119,000	5,619,000	902,000	1,463,000
Daily average	203,967	181,258	128,857	209,000

*Revised.

42% Gasoline and Bunker C Fuel Oil *from* heavy Smackover crude!



Smackover, Ark., plant of the Simms Oil Company, operating a 2500 bbl. Kellogg Tube Still and two 1000 bbl. Cross Cracking Units with flue gas recirculation.

THE Kellogg pipe still and Cross cracking installation at the Smackover plant of the Simms Oil Company is giving ultimate products and yields as follows:

Product	*Ultimate Yield Percentage of Virgin Stock*
Gasoline	42.32
Fuel Oil	53.87
Gas, Coke and loss	3.81
Total	100.00

The charge consists of 20.4 gravity Smackover crude. The average thruput is 2910 bbls. per 24 hrs.

For the pipe still alone, the products and yields are:

PIPE STILL YIELDS

Product	*Percentage of Total Charge*
Gasoline	17.40
Cycle Gas Oil (Cross Plant Recharging Stock)	47.02
Fuel Oil	35.58
Total	100.00

Since both the tube still and Cross still use the same fuel tanks, 100% recovery is assumed for the pipe still. All loss is thrown on the Cross plant, which gives products and yields as follows:

CROSS STILL YIELDS

Product	*Percentage of Total Charge*
Gasoline	53.00
Fuel Oil	38.95
Gas, Coke and loss	8.05
Total	100.00

AVERAGE TEST *of* UNTREATED GASOLINE PRODUCED

Gravity A.P.I.	51.4
Color (Saybolt Chromometer)	15

A. S. T. M. DISTILLATION

Initial	101° F.
20%	219° F.
50%	325° F.
90%	407° F.
End Point	433° F.

AVERAGE TEST *of* FUEL OIL PRODUCED

Gravity A.P.I.	9.0
Flash (Clev-o-cup)	280° F.
B.S. & W. by centrifuge	1.5
Viscosity at 122° F. (Saybolt Furol)	120

KELLOGG

CROSS CRACKING PLANTS—BUBBLE TOWERS—PIPE STILLS—HEAT EXCHANGERS—GRAY TREATING TOWERS—TREATING PLANTS

THE M. W. KELLOGG CO., 7 DEY STREET — NEW YORK

KANSAS CITY, MO., 700 BALTIMORE AVE. — SAN FRANCISCO, CAL., 444 MARKET ST.
LOS ANGELES, CAL., 329 PETROLEUM SECURITIES BLDG.

Twenty-Two Indiana County Tests

Much Wildcatting Being Done in That State and in the Central West Field. Some Interesting Showings Found

By Whit

Staff Correspondent, Central West Fields

FINDLAY, Ohio, Oct. 17.—In the four divisions of the Central West Field, comprising the Lima, Indiana, Illinois and Central Ohio Fields, there were a total of 26 wells reported since the last report, with 13 producers, with an initial of 287 bbls., 6 dry holes and 7 gas wells. Two wildcat wells were found in the Lima Field, one in Webster Township, Wood County, on the George L. Dailey farm, for 10 bbls., and another in Union Township, Mercer County, on the Tom Fierovid farm, with an initial of 14 bbls. These wells are not of the big well class but they show extensions which are important and may lead up to something better in the near future.

As to wildcat work both Indiana and Central Ohio have it on the Lima, and Illinois areas, as more of the wells drilled in the Central Ohio Field are advance tests instead of in defined limits and in Indiana a score of tests are under way in many sections of the State. The finding of a gas well on the Lincoln Walton farm, in the eastern portion of Daviess County, to the west of Loogoottee, in southwestern Indiana, is an important find, as is a wildcat in Hancock County, same State, near McCordsville. There was also a nice showing of oil at a test on the Phillips farm, near Gentryville, in Spencer County, which indicates that possibilities are good for both oil and gas in many parts of the Hoosier State.

Lima Field

Development work is quiet in the old Lima Field of northwestern Ohio at this time and it is doubtful if any revival will be shown during the late fall and winter season, but with better prices prevailing the early spring season should see a wonderful change, as thousands upon thousands of acres have been taken under lease along the outer edges of the extensive field in all directions, as well as within defined limits where old wells have been abandoned and where the average oil man familiar with the Trenton Rock area, expects to find production with deeper drilling in this well-known producing sand which is known to have a thickness of around 800 feet.

W. J. Lyon and others drilled a test 1,200 feet from the south line and 200 from the east line of the George L. Dailey farm, in the SW of Section 34, Webster Township, Wood County, topping the Trenton at 1,188 feet and going 51 feet in the sand, where oil was found at a total depth of 1,239 feet, the well producing 10 bbls. the first 24 hours. While this is a rather light producer, it is important as to location and adds quite a scope of undrilled territory to the older producing areas.

In Union Township, Mercer County, W. B. Lawrence and others' test in the NW cor. of the Thomas Fierovid farm, in the NE of Section 21, showed a first 24 hours' production of 14 bbls. Sand was found at 1,152 feet and oil at 48 feet in the sand. In Butler Township, same county, Gailey Myers' No. 5 well, 1,500 feet from the south line and 300 from the east line of the J. G. Wenning farm, in the SE of Section 31, topped sand at 1,110 feet and oil at 50 feet in the sand, and showed light, doing only 2 bbls. the first day's pumping.

Frank Haubert and others' No. 3 well, 1,600 feet from the north line and 200 from the west line of the Fanny Havens farm, in the SE of Section 17, Jackson Township, Sandusky County, pumped an initial of 5 bbls. Sand was found at 1,264 feet and sent 47 feet in the sand to a total depth of 1,311 feet.

The Great Northern Oil & Gas Co. drilled a test in the SE cor. of the E. Deppen farm, in the NE of Section 10, Eden Township, Seneca County, in the Tiffin Field, striking top of sand at 1,672 feet and going 326 feet into the Trenton sand to a total depth of 1,998 feet, failing to find a commercial showing of oil and is listed with the dusters, which are few in the old Lima Field.

At the present time there are about 25 strings of drilling tools at work in the Lima Field and its extensions.

Indiana

Twenty-two counties in Indiana are now being given tests and the State leads other divisions of the Central West in wildcatting at this time. In these counties no production of any account has been found in the past and with this amount of test work under way, something worth while should be discovered. The best oil showing of any of them up to date was reported on the Phillips farm, near Gentryville, in the northwestern portion of Spencer County, almost directly north of Owensboro, Ky., and in the southwestern portion of the State. The well was drilled by the Premium Oil Co., and the pay found at 1,214 feet. Reports were the showing was for about 30 bbls., but not yet confirmed.

A wildcat drilled by Charles Teeters on his own farm, northwest of Hagerstown, in the northwestern part of Wayne County, northwest of Richmond and southeast of Muncie, is reported showing a nice gas volume. Very little wildcat work has been done in this area in the past and it would not be in the least surprising to see a nice gas field developed by further test work. This test is not so far away from developments in Darke County, in the Lima Field and just across Wayne County from the Ohio state line.

Another important test is that north of the town of McCordsville in the northwestern portion of Hancock County, between Indianapolis and Fortville and southeast of Noblesville, drilled by the Vernon Gas Co. This is in line with the old Trenton Rock Field of Indiana. A test now under way by Snyder and others near Fortville, to the northeast of the gas well mentioned, will be watched with interest.

Some of the important tests under way at this time are nearing a depth where something worth while should be found, especially in the Loogoottee area of Martin County in the southwest portion of the State; Fountain County, in the western portion, near the Illinois state line, north of Sullivan and southeast of Lafayette; Gibson County, southwestern portion; Greene County, north of Daviess County and east of Sullivan County; Hamilton County, north of Indianapolis, where the Noblesville Field was opened in the early days back in the nineties; Harrison County, extreme southern part of State; Henry County, south of Delaware County and east of Madison County; Shelby County, southeast of Indianapolis; Lagrange County, extreme northeastern part of State; Tipton County, north of Hamilton County, and southwest of Grant County; Wabash County, west of Huntington County and north of Grant County, and others.

South of the hamlet of Ekin, in Jackson Township, Hamilton County, the Sheridan Oil & Gas Co. drilled a dry hole on the Stephen Cox farm, looking for gas.

Louisville Gas & Electric Co. drilled a nice gas well at a test on the G. B. Melton farm, in Boone Township, Harrison County.

In Veale Township, Daviess County, in the southwestern part of Indiana, the test of Hartman & Sargent on the Delbert Barber farm, Section 28, is rated around 5 bbls., from a depth of 1,150 feet, failing to find a pay in the deeper sands. In the eastern portion of the county, in Barr Township, J. F. Arnold and others brought in a commercial gas well at a test on the Lincoln Walton farm.

In the wildcat well drilling by J. W. Hunt and others on the J. W. Crisler farm, southwest of the town of Lagrange, in Lagrange County, a nice gas showing is reported at a depth of 900 feet. This test is not far from the Indiana-Michigan line.

In the old Trenton Rock area, in Wabash Township, Adams County, in the field east of Berne, W. E. and C. H. McKelvey's test on the John Brown farm, Section 1, is reported making a showing for a 5-bbl. pumper.

State Report

Oil and gas information from Indiana compiled by T. M. Kingsbury, state gas supervisor, Department of Conservation of Geology, Indianapolis, given in part by counties, follows:

Adams County—J. E. McKelvey and others drilling on the John Brown farm, Section 21, Wabash Township, brought in a small oil well. On account of the low price of oil there has been little new development in the east Berne Poole.

Daviess County—Hart Brothers have got possession of interests they formerly owned in the Barr Township Field and plan to start drilling at once, the location not yet being determined. In Barr Township, Ruble & Collier are drilling on the Walker farm, just east of their McCracken lease. A good gas well was completed by J. F. Arnold and others on the Lincoln Walton farm, Section 35, just west of Loogoottee. It is planned to drill two other wells, the gas to be piped to Loogoottee. Hartman & Sargent completed what is reported as a small oil well on the Delbert Barber farm, Section 28, Veale Township, at 1,150 feet. This well is just south of the Peek & White leases.

Fountain County—A new cable has been secured and work is progressing on the test well being drilled on the William B. Coffing farm. According to last reports, the well is 2,334 feet down.

Grant County—It is reported the Fowlerton Oil & Land Co. has taken 568 acres of leases in this county.

Greene County—No report has been received from the Keystone Oil Co., which has taken leases in the western part of the county and reported a test would be started at once.

Hamilton County—Drilling for gas, the Sheridan Oil & Gas Co. got a dry hole on the Stephen Cox farm, Jackson Township, south of Ekin.

Hancock County—The Vernon Gas Co. of Fortville completed a small gas well just north of McCordsville. Snyder and others are drilling near Fortville.

Harrison County—The Louisiana Gas & Electric Co. has completed a gas well on the G. B. Melton farm, Boone Township. This company is drilling on the M. W. Funk farm, Section 13. In this well a pocket of oil was encountered at 170 feet but no commercial production was obtained and drilling for gas was continued. A gathering line is being laid from the company's compressor station to its wells. The Railroader's Gas Co. has changed hands and the holdings, including 40 gas wells, will be operated by a new company known as the Southern Indiana Utilities Co.

Henry County—The Knightstown Gas Co. is drilling for gas on the Kahn farm, just west of the town of Knightstown. This is the first of three wells it plans to drill before winter.

Lagrange County—The test well being drilled by J. R. Hunt and others on the Ivo Chrystler farm is reported to have encountered gas at 900 feet, but drilling is being continued in an effort to find oil.

Martin County—Drillers on the test well on the Luther Hart farm, Section 19, Barket Township, 4 miles north of Indian Springs, are having trouble in setting casing. They are down about 500 feet. Ruark and others have started drilling on the McConn farm south of Loogoottee.

Pike County—Perry Andrews, drilling No. 8 on the A. Atkinson farm, Section 23, Logan Township, encountered water at 1,390 feet. In this township, Singer and others are shut down for orders with a well on the Pink Atkinson farm, same section, at 1,220 feet, and Morrisey and others have stopped drilling at 900 feet on a well on the William Miley farm, Section 14. The Ohio Oil Co. is drilling two wells in Section 26, Madison Township, on the R. Morgan farm and on the N. B. Coffman farm.

Shelby County—The Brandywine Oil & Gas Co. is drilling No. 4 well on the Walter Bass farm, north of Fairland. Its other wells produce a small amount of oil. A well for gas is being drilled near Morristown.

Tipton County—The first of two test wells to be drilled in Duck Creek Township, on the William Steele farm, is down 1,000 feet.

Wabash Township—Frank Lawson and others have started a test well east of Lagro Township.

Wayne County—Charles Teeters has completed a gas well on his farm, northwest of Hagerstown.

Illinois

But seven completions were reported from over the Illinois territory since the last report. The best producer recorded was found in the Allendale Field of Wabash Township, Wabash County, when Joe S. Young, Jr., and others brought in No. 6 well, 1,000 feet from the north line and 600 from the west line of the Joe Keyser farm, in the NW of Section 13, and south of the town of Allendale, for 30 bbls. initial production. Top of sand was found and the pay at 18 feet in the sand.

Two completions were made in Crawford County, in what is known as the Robinson Field. In the town of Robinson on the McCarty town lot, the Robinson Gas Co. drilled in a light gas well at a depth of 956 feet. In Honey Creek Township, the Selby-Cisler Producing Co.'s No. 8 well, 575 feet from the north line and 125 from the east line of the Cawood heirs farm, in the SE of Section 36, pumped 5 bbls. at a depth of 992 feet.

West of Casey in Union Township, Cumberland County, in the old Siggins Pool, Paul J. Campbell's second test, 500 feet from the north and east lines of the George Kuhn farm, Section 11, pumped 2 bbls. initial at a depth of 545 feet.

In Carrigan Township, Marion County, the Mt. Vernon Development Co.'s test, 273 feet from the north line and 240 from the west line of the Albert Sebastian farm, in the NE of Section 27, came in a dry hole at a depth of 2,280 feet, there being no sand encountered by the drill in this hole.

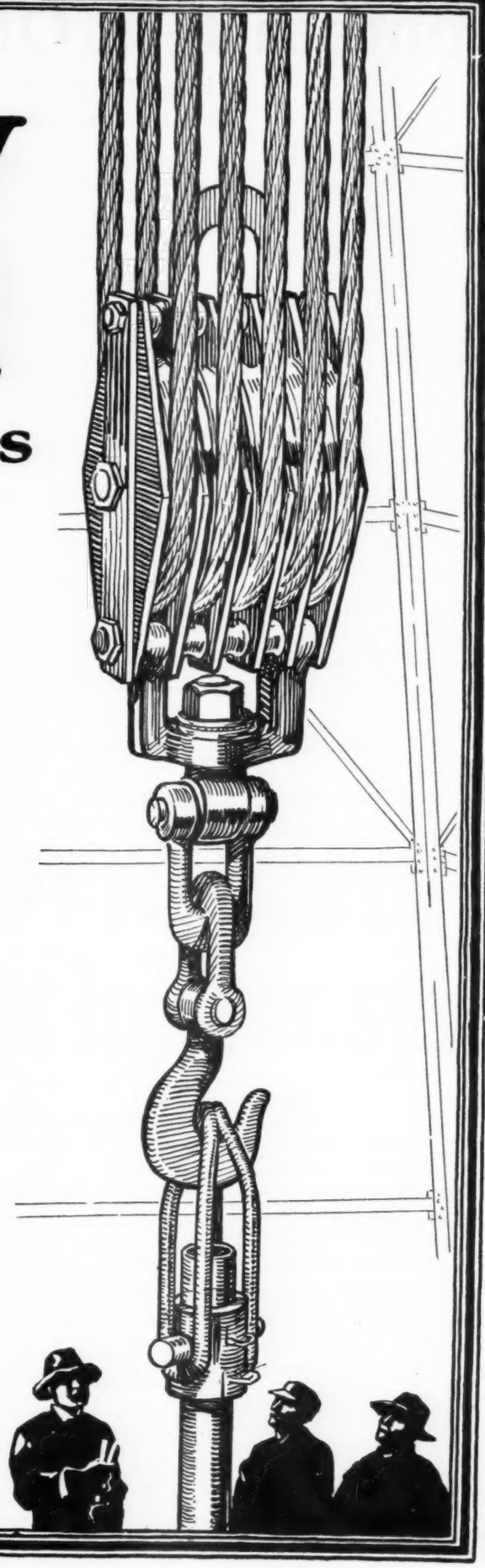
In the western part of the State, in Bethel Township, McDonough County, Zemple and others' test, 400 feet from the north line and 300 from the west line of the D. E. Val farm, in the SW of Section 33, proved a duster at a depth of 970 feet.

A purely wildcat venture made by Weber & Cole, 600 feet from the south line and 400 from the east line of the W. O. Powell farm, in the SE of Section

(Continued on Page 141)

Yellow Strand

Rotary Drilling Lines



It's strength you need in a Rotary Line—strength combined with the ability to bend around the sheaves of the crown block without injury.

It is this valuable combination of qualities that causes Yellow Strand Rotary Lines to last longer and be so economical.

The wire for Yellow Strand is drawn to our special specifications in Europe and imported by us. No wonder Yellow Strand Rotary Lines are so good!

Ask for Catalog K-2

BRODERICK & BASCOM ROPE CO.
St. Louis, Mo.

Branches: 68-70-72 Washington St., New York City, and Seattle, Wash.

Factories: St. Louis, Mo., and Seattle, Wash.

K388

Southeastern Ohio Has Fruitful Week

Licking County Has More Completions Than Any Other County. Best Initial Producer Found in Holmes County

By D. S. Wakenight
Staff Correspondent, Eastern Fields

PITTSBURGH, Pa., Oct. 17.—The week just closed was more fruitful of good producers in the southeast Ohio fields than for a number of months. Neither the West Virginia nor the southwest Pennsylvania fields completed any large producers.

In Lot 11, Monroe Township, Holmes County, the Arkansas Fuel Oil Co. completed and shot in the Clinton sand No. 4 on the W. M. Miller farm. It produced 125 bbls. the ensuing 24 hours after shot. This was the highest initial production of any well completed during the week.

Licking County Leads

Licking County was credited with having more completions than any other county. In the northwest quarter of Section 15, Bowling Green Township, Robinson & Zahnizer completed a test on the Nathan Mack farm and by flowing and swabbing it placed 75 bbls. to its credit the first 24 hours. In addition to its oil production it has a gas pressure estimated at 250,000 feet a day. In Lot 7, Hanover Township, same county, the Pure Oil Co. drilled through and shot in the Clinton sand a test on the H. C. Priest farm. It had an initial production of 40 bbls.

In Lot 22, New Castle Township, Coshocton County, the Preston Oil Co. completed a test on the Stephen Sells & Co. farm good for 90 bbls. a day after shot.

Two for Hocking County

In the northwest quarter of Section 27, Washington Township, Hocking County, the Riggs Oil Co.'s test on the C. W. Riggs farm produced 40 bbls. the first 24 hours after drilled through and shot in the Clinton sand. In the southeast quarter of Section 10, Washington County, the Right Oil Co.'s test on the White-Henghst farm produced the same amount the first 24 hours after shot in the Clinton sand.

In Section 5, Jackson Township, Muskingum County, the Hope Construction & Refining Co. completed and shot in the Clinton sand its test on the W. H. Elphry farm. The well produced 105 bbls. the ensuing 24 hours.

Jefferson County

In the northeast quarter of Steubenville district, Jefferson County, Braden, Spear & Co. have completed in the Berea grit a test on the Hutterlt heirs' farm, good for 10 bbls. a day. This well is in old territory and the first completed in that locality for many years. In the northwest quarter of the northwest quarter of Section 11, Monroe Township, Coshocton County, the Empire Gas & Fuel Co. has completed a test on the H. A. Brush farm. It is a duster in the Clinton sand, having developed no oil or gas.

In Section 24, Green Township, Hocking County, the Logan Natural Gas Co. has a duster in the Clinton sand at a second test on the Almeda Linton farm. In Westland Township, Section 15, Guernsey County, Davis Brothers Co.'s Nos. 4 and 5 on the R. Ruby farm are through the Niagara lime and good for 25 and 30 bbls., respectively.

Dusters are of frequent occurrence in this county, the Niagara lime seems to be an irregular producing formation. In Sections 8, 10 and 19, Adams Townsbip, The Ohio Fuel Supply Co.'s tests on the Samuel Armstrong, C. F. Johnston and George Sherman farms, are all dusters. In Sections 11 and 20, Westland Township, the Leonard Oil & Gas Co. has rigs completed for Nos. 4 to 7, inclusive, on the James Joyce & Co. farm. In Section 5, Cambridge Township, Blackstone and others have a rig up on the John Dunning farm. In Jackson Township, the Ohio Fuel Supply Co. has rig material at a location on the Charles Wigginton farm.

Holmes County, once the most active in southeast Ohio, has dropped back and has but few wells drilling and nearly all due in the Clinton sand. In Killbuck Township, the East Ohio Gas Co. is due in the Clinton sand at a test on the D. N. Snow farm. In Richland Township, the Ohio Fuel Gas Co. is drilling a test on the Malissa Manchester farm. The Empire Gas & Fuel Co. has the rig completed for a test on the Delpha Nethrow farm. In Section 9, Prairie Township, the Ohio Oil Co. is drilling a test on the Jacob E. Miller farm.

Late Completions

At the close of the week all completions in the southeast Ohio fields, with the exception of one, were located in shallow territory and were light pumpers, dry holes or gas wells. In Section 2, Perry Township, Licking County, Murphy & Co. drilled a test on the J. M. Cullison farm through the Berea grit and dry. In the southeast quarter of Section 2, Fallsbury Township, the Arkansas Fuel Oil Co. has a 5-bbl. pumper in the same formation at a test on the Jane Anderson farm. In the southeast quarter of Section 1, same township, the Margaret Oil Co.'s second test on the Manuel Rinehart farm is a 3-bbl. pumper. In Section 21, Franklin Township, Ralph Brothers have a similar pumper at No. 1 on the Boy Scout property.

In the southeast quarter of Section 11, Westland Township, Guernsey County, the Ohio Fuel Supply Co. has completed in the Niagara lime No. 5 on the W. C. McCourt farm. It is not good for more than 12 bbls. a day at a total depth of 3,670 feet.

Morgan County

Two miles north of Sharpsburg, in Section 31, Marion Township, Morgan County, the Ohio Fuel Supply Co.'s No. 5 on the John Joy farm is a gasser in the stray sand below the Berea grit, good for 275,000 feet.

Six miles south of Newark City, along the Jackson Pike, in Section 15, Licking Township, Licking County, the A. H. Heisey company has completed a test on the Homer Davis farm. It is a gasser good for 400,000 feet. In the north half of the southeast quarter of Section 9, Monroe Township, Coshocton County, the Empire Gas & Fuel Co. has completed in the Clinton sand a test on the H. R. Brillhart farm. It is a gasser good for 300,000 feet and has a light showing of oil.

In Lot 5, Section 4, Monroe Township, Holmes County, the Lydia Gas Co. has completed in the Berea grit No. 5 on the Jemima Bell farm. It found no oil and only a light gas pressure. It will probably be pulled out and abandoned.

In Fractional, Section No. 15, Rome Township, Athens County, one-half mile northwest of the village of Beebe, O. C. Dunn has completed No. 15 on the A. C. Finsterwald farm. It is a 4-bbl. pumper in the First Cow Run sand.

In Section 29, Knox Township, Columbiana County, L. H. Benninghoff has completed in the Berea grit No. 8 on the Walter Heffner farm. It is a very light pumper. At the head waters of Sheets run, Grandview Township, Washington County, J. T. Knowlton and others have completed in the Big Injun sand No. 4 on the R. E. Myers farm, good for 10 bbls. a day.

In the southeast quarter of Section 13, Reading Township, Perry County, 5 000 feet northwest of the Hope Construction & Refining Co.'s test on the Margaret E. Barnes farm, the Ohio Fuel Supply Co. has completed and shot in the Clinton sand a second test on the D. G. Love farm, good for 50 bbls. a day.

Shallow Sand Territory

In the southeast quarter of Section 31, Sutton Township, Meigs County, the Ohio Fuel Supply Co. has completed in the Berea grit a test on the William Rasp farm. It is a gasser good for 250,000 feet.

In the southeast quarter of Section 11, Switzerland Township, Monroe County, the American Natural Gas Co. completed a test on the Robert Bey farm. It is a duster, having developed no oil or gas in the Berea grit or any of the upper formations.

Near New Philadelphia, Tuscarawas County, the well drilling by the county commissioners is through the Berea grit and is a duster. They will drill it deeper and hope to get a producer in a lower sand. It is located on the Infirmary farm.

West Virginia

On Road Fork, Lee district, Calhoun County, the McCall Drilling Co. has completed a test on the Alva McLaughlin farm. The location is 4 miles northeast of production. The location is somewhat important and may open an extension to the present development.

In Courthouse district, Lewis County, the Hope Natural Gas Co. has completed a test on the Clara A. Hill farm. It is a duster in all sands. In the same district, the same company has a very light pumper in the Gordon sand at a test on the J. A. Roarbaugh farm.

In Grant district, Ritchie County, Little & Trainer have a gasser in the Big Injun sand at a test on the Charles Pearcy farm. In the same district, Swingle & Co. have a duster at a test on the Calvin & Robery Templeton farm. It has been abandoned.

In Union district, Pleasants County, L. C. White & Co. completed a test on the James Dennis farm. It is dry in the Big Injun sand, but will make a light pumper in the Big Lime formation. In Coal district, Harrison County, the Clarksburg Light & Heat Co.'s No. 254, on the S. D. Core heirs' farm, is a gasser in the fourth and fifth sands.

Clay County

On Lowthers Run, Murphy district, Ritchie County, the Hope Construction & Refining Co. completed a test on the J. L. Hill farm, drilled in during the previous week and had a production of 200 bbls. for a few days, and settled down to 60 bbls. a day. It is located in defined territory and was not expected to hold up for any considerable time.

In Henry district, the Virginian Gasoline & Oil Co.'s No. 3, on the P. D. Summers farm, 500 feet southwest of No. 2 on the same farm, is good for 35 bbls. a day in the Big Injun sand. In Geary district, Roane County, Noble Beattie has completed in the salt sand a test on the Julia Bent farm. It is a gasser good for 500,000 feet. The location is 3,500 feet east of the company's second test on the Frederick Smith farm on the left fork of Big Sandy Creek.

On King Knob Run, Murphy district, Ritchie County, the South Penn Oil Co.

(Continued on Page 142)

M'LEAN COUNTY KENTUCKY'S NEXT; CENTURY WELLS IN TENNESSEE

By Whit
Staff Correspondent, Kentucky-Tennessee

BOWLING GREEN, Ky., Oct. 15.—all completions from the Kentucky Field were reported from four counties and confined to the western division, with Ohio County the area where the good wells are being found. Tennessee also comes to the front with a couple of nice producers found in the Celina Field of Clay County, with production of 144 and 100 bbls. The finding of a nice volume of natural gas at a depth of 270 feet in Metcalf County is interesting but deeper drilling failed to show commercial oil. Five wells of the century class were opened in the Ohio County Field of Kentucky, being No. 11 Fanny Lake farm, at 200 bbls.; No. 5 Cora Wells farm, at 200 bbls.; and No. 18 Mary J. Elmore farm, 200 bbls., all three in the Ambrose Pool, while in the new Sunnydale Field to the southeast a few miles from the Ambrose Pool, and in the same county, a second test on the J. C. Smith farm, showed 150 bbls.; and No. 3 Mary E. Wilson farm, 100 bbls.

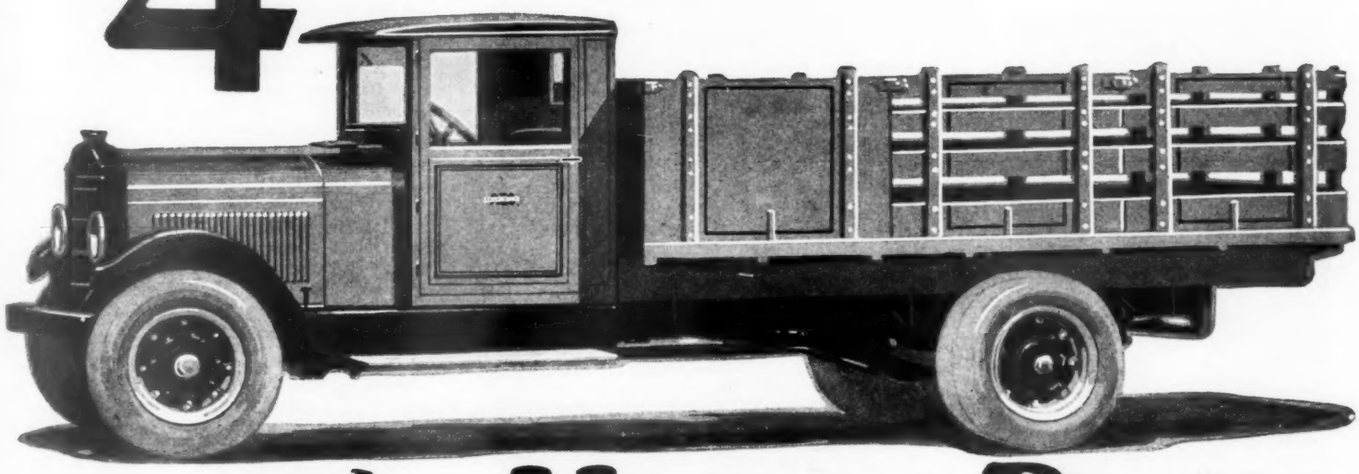
The general outlook for development work from this time on will be centered in all directions from the Ambrose Pool in Ohio County and extend in adjoining counties. Just now an interesting spot is near the town of Livia, in McLean County and some 12 miles west of production where Dimmick Brothers found an oil showing at 1,410 feet. The well is on the John Ratcliff farm, 3 miles west of the town of Livia, and oil started showing shortly after the drill entered the sand. Indications for a commercial producer were announced by the owners and Thomas Dimmick of Huntington, W. Va., was wired to come to the well before it was drilled in, and a few days will tell the story. Should this well live up to expectations it will open an entirely new area for development work in McLean County, also Daviess County, close by. This is by far the deepest venture yet drilled in that section of the country. It is located in an area that has been considered off line and the showing in the well has raised hopes of others proportionally, to such an extent that other tests are starting. In the vicinity, the Witmer Oil Co. has started a well on the H. D. Taylor farm, and L. C. Young and others one on the W. G. Hayden farm, and much leasing has been done and locations staked out for additional tests. McLean County entering the production of oil will add another county to the Tri-County Field of Daviess, Ohio and Hancock Counties, with great possibilities in Muhlenburg, Butler and other counties farther to the south. Leasers are very active in several counties through the region and in fact in all the territory between Daviess and Ohio Counties to the south and southeast as far as Barren and Warren Counties. While no large producers are being found in the Glasgow Field of Barren County, the drill keeps up to a good extent and the entire acreage of Barren County is being tested out.

Oil Field Map

In keeping with the rapid development of the Ohio County oil pools, a new map showing the subsurafce structural geology of the Ambrose district, was issued by the Kentucky Geological Survey. The area mapped is the producing belt

(Continued on Page 142)

The 4th of the NEW Speed Wagons



The Heavy Duty for hauling heavy loads at light load gaits and at light load costs

For Every Trucking Need

SPEED WAGON JUNIOR
Capacity up to one half ton
Chassis
$895
at Lansing

STANDARD SPEED WAGON
Capacity up to a ton & a half
133 in. Wheelbase Chassis
$1345
at Lansing
Also a 143 in. Wheelbase at
$1445

MASTER SPEED WAGON
Capacity up to two tons
Chassis
$1645
at Lansing

4 wheel brakes

and the
HEAVY DUTY SPEED WAGON
Capacity up to three tons
Dual Internal Brakes
Chassis
$2185
at Lansing

New Four-speed transmission—6-cylinder Speed Wagon engine—coupe cab—dual rear wheels—dual internal brakes—159-inch wheelbase—single plate clutch—air cleaner—automatic chassis lubrication with Myers Magazine Oilers—thigh-high load platform—completeness of equipment. Plus even more of the rugged durability that has saved thousands of dollars for Speed Wagon owners—

Sold ready for the road

REO MOTOR CAR COMPANY · *Lansing, Michigan*

SPEED WAGON

for faster, surer, easier, cheaper hauling

MEN KNOWN IN OILDOM

John M. Lovejoy

John M. Lovejoy, vice president and general manager of the Amerada Petroleum Corporation, and chairman of the petroleum division of the Institute of Mining and Metallurgical Engineers, has taken a most active part in the development and use of improved practices in oil field operations and in the methods employed in searching for new petroleum deposits.

After graduating from the School of Mines, Columbia University, in 1911, as a mining engineer, Mr. Lovejoy went to Chuquicamata, Chile, where the Guggenheim interests were operating a mining property. After a few months at Chuquicamata he left for Huantijaya, one of the oldest and most productive silver mines of the world. After two and one-half years in South America, Mr. Lovejoy returned to the States, and after working for a year in the Gilpin, Colorado, mining district, went in 1914 to China on his first venture into the oil business.

Returning to the States, Mr. Lovejoy found the activities of a "rockhound" quite different in Wyoming, where he went to work for The Texas Company on his return.

Not content with doing surface work, Mr. Lovejoy secured a job as roustabout at Electra, and was still doing actual field work when he joined the first officers training corps at Madison Barracks, New York. He crossed in February, 1918, as first lieutenant, attended the French artillery school at Saumur, was attached to the Fifty-fifth Field Artillery Brigade, and soon afterwards was promoted to captain. He had the good fortune to command in the St. Mihiel and Argonne offensives.

After he was mustered out in 1919, Mr. Lovejoy was sent to Oklahoma by E. De Golyer, then vice president of the Amerada Petroleum Corporation, with the title of "agent." The then infant Amerada Petroleum Corporation had no production, but Mr. Lovejoy picked up a few leases and started to drill. The first producing well was in the Beggs Field, and from that time the progress of the corporation has been gradual but sound and sure. In January, 1926, Mr. Lovejoy was made vice president and general manager.

PERSONAL PARAGRAPHS

A. H. Rowan, of Fort Worth, Tex., has been in San Antonio, Tex., for a few days on business.

* * *

H. S. Crowley, assistant superintendent of pipe lines for The Texas Company in Louisiana and Arkansas, has taken unto himself a wife and is spending a short honeymoon in Dallas, Tex.

J. R. (Dick) Dimond, South Texas oil scout, spent his vacation in Dallas, Tex., and is back in the Mirando fields.

* * *

Harvey J. Stone, of the Hope Oil & Gas Company, has returned to Fort Worth, Tex., from a trip to Yoakum County.

* * *

J. K. Davis, independent operator and contractor of San Antonio, Tex., was a San Angelo, Tex., visitor last week.

* * *

Dr. Edward Binney, Jr., assistant research geologist of Yale University, has been spending a few weeks near Cody, Wyo.

* * *

R. B. Huffman, of the Andrews Petroleum Company, has returned to San Antonio, Tex., from a visit to New York City.

* * *

A. R. McElreath and F. R. Suggett, well-known Wichita Falls, Tex., operators, were Fort Worth, Tex., visitors this week.

* * *

Merle Gunby, scout of the Standard Oil Company, is back in the Mirando, Texas, territory, from a trip through West Texas.

* * *

John Edwards, general sales manager of the Paragon Refining Company, of Toledo, Ohio, spent a few days at Cincinnati, Ohio.

* * *

H. C. Mulroy, vice president of the Marland Refining Company, in charge of traffic, is a candidate for mayor of Ponca City, Okla. Up to last report he was without opposition.

* * *

R. S. McFarland, secretary and head of the land department of the Twin State Oil Company with headquarters in Tulsa, Okla., was in Dallas, Tex., for several days on business of his company.

* * *

Travis Golay, of Denver, Colo., in charge of operations in the Rocky Mountain region for the Marland Oil Company of Colorado, has returned from a hunting trip south of Yellowstone National Park.

* * *

Joseph M. Wilson, geologist for the Simms Oil Company, who has spent the past two months in the Mexia, Tex., office, has returned to San Angelo, Tex., where he was stationed before going to Mexia.

* * *

Donald W. Cummings, of Tulsa, Okla., arrived in San Angelo, Tex., last week to make preparations for starting a well on the Blackstone & Slaughter ranch in Pecos County, southwest of the Yates Pool.

* * *

R. O. Lowrence, land man for the Sinclair Oil & Gas Company at Fort Worth, Tex., spent three days last week in Mexia and Corsicana, Tex., investigating some leases and looking over the Cedar Creek Field.

* * *

Thomas Maple and Frank B. Russell, Louisville, Ky., oil operators, are spending some time in the Tri-County Field of Daviess, Ohio and Hancock Counties, Kentucky, securing acreage for development work.

* * *

J. A. Warren, of Denver, Colo., head of the land department for the Kinney-Coastal Oil Company, was in Casper, Wyo., recently en route to Riverton, in company with Harry Conley, superintendent of operations.

* * *

George F. Prussing, secretary of the safety board of the Union Oil Company of California, has just returned to Los Angeles from Chicago, where he attended the National Safety Union and was elected chairman of the petroleum section of the council for the ensuing year.

* * *

James S. Curry, of Pittsburgh, Pa., head of the leasing department of the South Penn Oil Co., has returned from Salt Lake City, Utah, where he and Mrs. Curry spent two weeks with their daughter, Mrs. B. H. Wayne, now a resident of that city.

* * *

C. P. Butcher, chief geologist in West Texas for the Kirby Petroleum Company, with headquarters at San Angelo, has resigned effective October 8. He was formerly with the Humphreys-Boyd Oil Company and went with the Kirby company last July. His successor has not been announced.

L. W. Stahl, representative of the Wilson-Snyder Manufacturing Company, of Pittsburgh, Pa., has been in Shreveport, La., for a short visit.

* * *

J. W. Van Dyke, president of the Atlantic Oil Producing Company, visited West Texas last week in company with several officials. Headquarters of the Atlantic in that area are maintained at Odessa in Ector County.

* * *

A. W. Golden, retired president of the Tide Water Pipe Company, who has been ill in the Bradford hospital in Bradford, Pa., is reported to be improving. Mr. Golden entered the oil business about 50 years ago. The veteran's many friends will be pleased to learn that his illness has taken a turn for the better.

* * *

M. M. Orr, of the Standard Oil Company, whose home is at Laredo, Tex., has been on a several months' trip to South America and is expected back some time this month. In the meantime his orange grove is being taken care of by W. C. Seale, another oil man, connected with a New York company, who has recently returned from a trip to that city.

* * *

The following members of the Gypsy Oil Company have returned to Tulsa, Okla., after the annual conference of Gulf officials which was held last week in Pittsburgh, Pa.: Henry McGraw, vice president; Rush Greenslade, third vice president; S. G. Sanderson, head of the gasoline department; C. P. Dimmit, general superintendent; W. B. Wilson, chief geologist; and B. F. Bridges, Jr., head of the land department.

* * *

The resignation of J. Frank Kelsey, vice president of the Independent Oil & Gas Company in charge of the North and West Texas district at Fort Worth, has been accepted and he is making his office temporarily with Sid Richardson in the Fort Worth National Bank Building. Mr. Kelsey has not announced his future plans beyond the fact that he intends to take a much-needed rest for a while but is considering propositions with a couple of major concerns in the West Texas area.

* * *

The North Texas offices of the Philmack Company are being moved to Tulsa, Okla. G. H. Collingwood is in charge of the Fort Worth, Tex., office and will be located in the Tulsa office of the company where he will have charge of the same work. J. Marshall Brown, geologist for the company, who has been dividing his time between the Fort Worth office and field work in West Texas, will be stationed at San Angelo, Tex., and will serve as representative of the company in that district.

* * *

R. W. McIlvain, vice president of the Pure Oil Company, visited the new offices of his company in the newly-constructed Petroleum Building at Fort Worth, Tex., last week for the first time since its removal from Mexia, Tex. While in this area he and six other Pure Oil Company officials made a tour through West Texas, inspecting the company's new quarters under construction at Odessa in Ector County, and its leases in Winkler, Crane and adjoining counties. The Pure Oil Company has some highly valuable holdings in that district.

* * *

When Arthur Durham, of Bartlesville, Okla., and his bride, stepped off the train in Mr. Durham's old home, Sistersville, W. Va., recently, they were met by a party of friends with a 1903 type of Oldsmobile. The newlyweds were given an old-fashioned charivari, after which they were taken to the home of Mr. Durham's uncle, E. A. Durham, widely-known oil and gas executive. Mr. and Mrs. Durham have since returned to Bartlesville, where the former is connected with the Wiser Oil Company.

* * *

T. S. Cooke, western manager for the Standard Oil Company of Indiana with headquarters at Casper, Wyo., has returned from Venezuela. It is understood he is to be in charge of the operations of the Pan American Petroleum & Transport Company which has refineries in Louisiana, Tampico, Mexico, Baltimore, Md., and has authorized the building of one in either Venezuela or the West Indies to refine production from Venezuela. Mr. Cooke was accompanied on his trip by Don and Lloyd Smith of the Standard plant at Casper, and P. G. Weidner of the engineering department of the Midwest company.

"OILWELL" HERCULES STEEL SUCKER RODS

"OILWELL"

Originated the Upset Steel Sucker Rod
Made from One Piece of Steel and Weldless

Features of
"OILWELL" Hercules Steel Sucker Rods

Free wrenching which saves labor and time, and also eliminates the freezing of threads. The end of the pin on all Hercules Rods is crowned to protect the first thread from damage and to facilitate easy starting of the joint.

Friction joints—Hercules Joints "shoulder up" readily and are easily locked with wrenches, thereby eliminating unscrewing in the well. The boxes are counterbored which keeps sand from accumulating on the joint shoulder when "setting up."

Fillet at pin base gives additional strength to pin.

"OILWELL" Hercules Steel Sucker Rods can be furnished in two styles — box and pin, or pin and pin with couplings. They are practical in design, sturdy in construction and efficient in service. Popular sizes are carried in stock at all district points.

"OILWELL" ESTD 1862 C T O TRADE MARK REGISTERED

Inquire at any of our 100 Branches

OIL WELL SUPPLY CO.

NEW YORK—LOS ANGELES—PITTSBURGH, U.S.A.—SAN FRANCISCO—TAMPICO—LONDON

WORLD'S OLDEST AND LARGEST MANUFACTURERS OF OIL FIELD EQUIPMENT

Natural Gas Developments

INCREASED USE OF GAS BY BRITISH CONSUMERS

The number of gas consumers in Great Britain during 1926 totaled 8,405,000. This represents an increase of 957,000, or about 13 per cent over the number of gas consumers in 1920, and a 2.5 per cent increase over the total gas consumers recorded for 1925.

The quantity of gas made during 1926 was 296,082,000,000 feet, or 4.3 per cent more than in 1925. This increase was entirely due to the increased make of water gas, as a smaller quantity of coal gas was made in 1926 than in 1925; only 16,564,000 tons of coal were carbonized in 1926, as compared with 17,031,000 tons in 1925, but 1,436,000 tons of coke for water gas, and 97,703,000 gallons of oil were used in 1926, compared with 1,153,000 tons of coke and 61,383,000 gallons of oil used a year earlier.

During 1926 276,569,000,000 feet of gas were sold. This figure included consumption for power purposes as well as for lighting and heating. The returns distinguish between consumers supplied by companies and those supplied by local authorities, and show that the companies supply about 60 per cent of the total consumers. Notwithstanding the higher proportion of prepayment consumers in company supply systems, the average consumption of all gas users served by companies was 34,000 feet in 1926, as compared with only 29,000 feet on the local authorities' systems.

The difference is more marked in the case of the ordinary user than in that of the prepayment customer, the companies' average supply to the ordinary customer being 49,500 feet and to others 22,300 feet, while the corresponding figures for local authorities were 33,800 feet to ordinary customers and 20,600 feet to prepayment customers.

AYLMER GAS RATE

CHATHAM, Ontario, Oct. 15.—G. F. Henderson, natural gas referee for Ontario, has given a decision fixing new gas rates for the town of Aylmer, Ontario, supplied by the Central Pipe Line Co. from the Vienna and Richmond gas fields in Elgin County. Under the referee's decision the original rate of $1 per 1,000 feet has been reduced to 75 cents, both rates subject to 5-cent prompt payment discount. It is reported the Central Pipe Line Co. will appeal. It is understood negotiations have been in progress for the taking over of the Aylmer system by the Dominion Natural Gas Co.

NATURAL GAS TO SAN ANGELO

SAN ANGELO, Tex., Oct. 15.—Natural gas was turned on at the city limits of San Angelo Monday night, Mayor W. D. Holcomb lighting flares in the presence of officials of the Western Gas Service Co. The gas came from North Coleman County in an 8-inch pipe line, 71 miles long, that was laid in 43 days, and tests revealed only four leaks. By the latter part of the week gas will be available over a big portion of the city, the initial flow being approximately 4,320,000 feet daily. The wells from which the gas flows gauge a total of 46,000,000 feet daily.

WHITE POINT GAS LINE

HOUSTON, Tex., Oct. 15.—Construction of the Houston Pipe Line Co.'s gas line extension from Refugio to the White Point gas field is expected to be completed within 30 days, according to information from the main construction camp at Taft. Pending the completion of this extension the Houston Oil Co. is continuing its development of the White Point Field, which will be the seventh gas field to be connected up with the system.

AMERICAN GAS ASSOCIATION CONSIDERS INDUSTRY'S PROBLEMS

CHICAGO, Oct. 15.—The gas industry is on the eve of its greatest expansion, according to heads of representative companies attending the ninth annual convention and exhibition of the American Gas Association at the Hotel Stevens, Chicago, last week, which brought together for the first time all branches of the business, following the amalgamation of the Natural Gas Association of America.

Samuel T. Bodine, chairman of the United Gas Improvement Co., of Philadelphia, declared the manufactured gas industry has established a record for stability, that it has gone along steadily in growth and that its securities are attractive from the investor's point of view. He discounted fear of a saturation point, quoting recent statistics that there is a large field for the increased use of gas for domestic purposes.

"The association of all elements of the manufactured and natural gas interests in the American Gas Association promises results of greater importance to these industries," said John J. O'Brien, president of the Byllesby Engineering & Management Corp. of Chicago, who predicted that sustained co-operative activities far beyond anything known in the past will follow the consolidation and declared the gas business today is in splendid condition. "I believe that the next few years will be ones of substantial and profitable growth," he continued, adding that the business as a whole needs more sales and advertising effort on modern lines.

R. Schadelee, president of the United Light & Power Co. of Grand Rapids, Mich., believes that the gas industry is in the most stable condition in its history. He foresees the largest success in the industrial heating field. "Present demand for gas for space and water heating," he added, "offers excellent possibilities for further cultivation."

Rates Chief Problem

The industry's chief task, in the opinion of Thomas N. McCarter, president of the Public Service Corp. of New Newsey, is the establishment of rate basis which will encourage the widest use of gas while providing revenues sufficient to protect present investment and attract new capital; to develop new uses of gas; to encourage use by improvement of service; and to acquaint every possible user with its merits. "Investment in the gas industry in the past has been safe and has yielded a reasonable return," he said, "and there is no reason to doubt a continuance of these conditions in the future."

P. S. Arkwright, president of the Georgia Power Co. of Atlanta, predicted that super-gas eventually will make its appearance. "In certain sections of the country where coal is mined," he said, "large producing plants will be erected and gas will be transmitted through a super-gas pumping system. This will eliminate the indetermined waste due to inefficient application when burning raw fuel and also eliminate smoke."

Fields for Expansion

Harry C. Abell, vice president of the Electric Bond & Share Co. of New York said: "Two present fields for expansion, house and industrial heating, are so fraught with possibilities that it is no exaggeration to say that the carbonization of coal, as carried on in the modern gas plant, and the sale of gas and the resulting by-products, will exert a powerful influence over the economic life of the entire nation."

H. B. Rust, president of the Koppers Co., of Pittsburgh, predicted that flat rates will be replaced by demand rates which will permit an equitable allocation of charges to the several classes of customers and will encourage the maximum

(Continued on Page 140)

AUTOMATIC CONTROL AIDS GAS HEATING

Automatic control has brought the gas-fired house furnace to a point where it can compete with the coal-fired furnace on economic grounds, as well as on the score of convenience and cleanliness, according to Alexander B. Macbeth, president of the American Gas Association.

"A study of temperature charts shows that temperatures vary considerably in most sections of the country," says Mr. Macbeth. "In a certain city it may be 10 below zero on January 5, and 32 above the next day. Under these conditions the user of a gas-fired furnace with automatic control is assured that gas is being used in proportion to the fluctuations of the weather.

"On a cold day the furnace will consume more gas than on a warmer day, but it cannot use more than just enough to keep the house at 70 degrees or any other temperature desired. The automatic control turns off the gas when the desired temperature is reached, and none is used until the temperature begins to drop. Then the gas goes on and brings the desired heat, only to cease fuctioning when it has accomplished its work.

"Crude fuels mean waste, regardless of the care taken to use them economically."

It is estimated that gas-fired house heating units are now being installed throughout the country at a rate of approximately 100,000 a year.

NORTHWESTERN OPERATIONS

CHATHAM, Ontario, Oct. 15.—A recent summary of the operations of Northwestern Utilities, Ltd., of Edmonton, Alberta, shows that the company which supplies natural gas to Edmonton from the Viking Field is experiencing steady growth. The company supplies domestic and industrial gas to Edmonton, with a population of 65,000; and also serves on its line from the Viking Field the towns of Ryley, Tofield, Bruce, Holder and Viking, and a number of smaller places. The company, which is a subsidiary of the International Utilities Corp., begun operations in 1923. At the beginning of 1924 there were 1,880 customers; the company is now serving close to 7,500 customers. The company's main and transmission lines extend over 200 miles. Sales of gas in 1925 amounted to 1,587,719,000 feet and in 1923 to 1,759,147,000 feet, and the 1927 sales is expected to show a further increase. For the 12 months ending June 30, 1927, the gross revenue of the Edmonton plant showed an increase of 90 per cent over the corresponding period in 1926, and the net revenue an increase of 212 per cent. The company has 14 producing wells in the Viking Field.

NEW GAS CONSOLIDATION

TOPEKA, Kans., Oct. 15.—The Union Pacific Service Corp. has been given authority by the Kansas Public Service Commission to begin business as a public utility. This company is a consolidation of several gas distributing companies in eastern Kansas which have been owned by the H. L. Doherty interests or were recently acquired. The company will distribute natural gas to the citizens of Colony, Welda, Baldwin, Edgerton, Gardner, Merriam, Shawnee, Lenexa, Paola, Osawatomie, Rantoul, Ottawa, Parsons, Richmond, Princeton, Cherryvale, Weir and Wellsville.

IDAMAY-LEXINGTON GAS LINE PROGRESS

Fair progress is reported being made by Rich & Co. of Bradford, Pa., on the construction of the 8-inch Idamay-Lexington natural gas line, but it looks as though it will not be completed for several weeks. Thirty-six miles of line are completed and 20 miles remain to be built. The first 11 miles reaching from Idamay to the waters of Station Camp Creek were very rough and rock and ranged in elevation from 700 feet to 1,300 feet above sea level. A good part of the line was through wilderness where close, dense thickets had to be cleared and where the work was slowed up on account of remoteness from the camps and railroads. The next 11 miles down Station Camp Creek to where the laying crew is at this time was "good going" although the line crossed four fair-sized creeks with high steep banks. The ditching machines started to work at the beginning of the 12 miles and continued to cut down Station Camp Creek at good speed. The machine is a Barber-Greene special pipe line ditcher.

It might be interesting to describe the layout at the Kentucky River crossing at Clays Ferry, 14 miles south of Lexington. Two lines 50 feet apart will be put across on the bottom of the river. Both lines will be buried two feet in the sand or mud. There is no rock on the bottom of the river at the crossing point. The two lines will be tied together on both sides of the river and one will be used as an emergency line. Both lines under water will be constructed of heavy soft open hearth steel weighing about 28½ pounds a foot, of welded joints with special oversized Dresser couplings for the welds. Each line will have five sets of special cast iron river clamps, each set weighing 620 pounds, making a total weight on each line of over 3,000 pounds. The river is 360 feet wide and the channel ranges in depth from 14 to 16 feet.

The line when completed will serve a total population of about 70,000, being made up of Lexington, Richmond and Irvine, and will deliver approximately 1,000,000,000 feet of gas annually.

GAS COMPANY TRANSFER

CHATHAM, Ontario, Oct. 15. — On October 1 the Union Natural Gas Co. of Canada, with offices at Chatham, took over the Chatham Gas Co., pursuant to an arrangement effected earlier in the year. The Chatham Gas Co. has been handling the distribution of natural gas in Chatham for 20 years, securing its supplies from the Union company. The local business will, it is understood, continue to be carried on in the name of the Chatham Gas Co.; and P. S. Coate, manager of the local company, will remain with the organization as a director. Under arrangements made last spring, the Union Natural Gas Co. has already done a great deal of work extending and enlarging the distributing system, and this will be continued. The Union company is now constructing a new office building from which the business of both companies will ultimately be handled.

GAS FOR SANTA BARBARA

SANTA BARBARA, Calif., Oct. 15.—Natural gas will be asked for Santa Barbara at a hearing on the city's petition for lower gas rates, scheduled to be argued before the State Railroad Commission here November 9. P. N. Berkeley, Los Angeles, gas expert, retained to represent the city at the hearing, advised local officials that this course be taken instead of seeking a reduction in rates at the coming hearing. The gas supply would come from the oil fields in Ventura.

Two *New* Reid 2 Cycle Gas Engines

40 HP and 45 HP—Entirely Enclosed

Splash Oiling System—Replaceable Main Bearings—New Governor

Greater Power and Economy

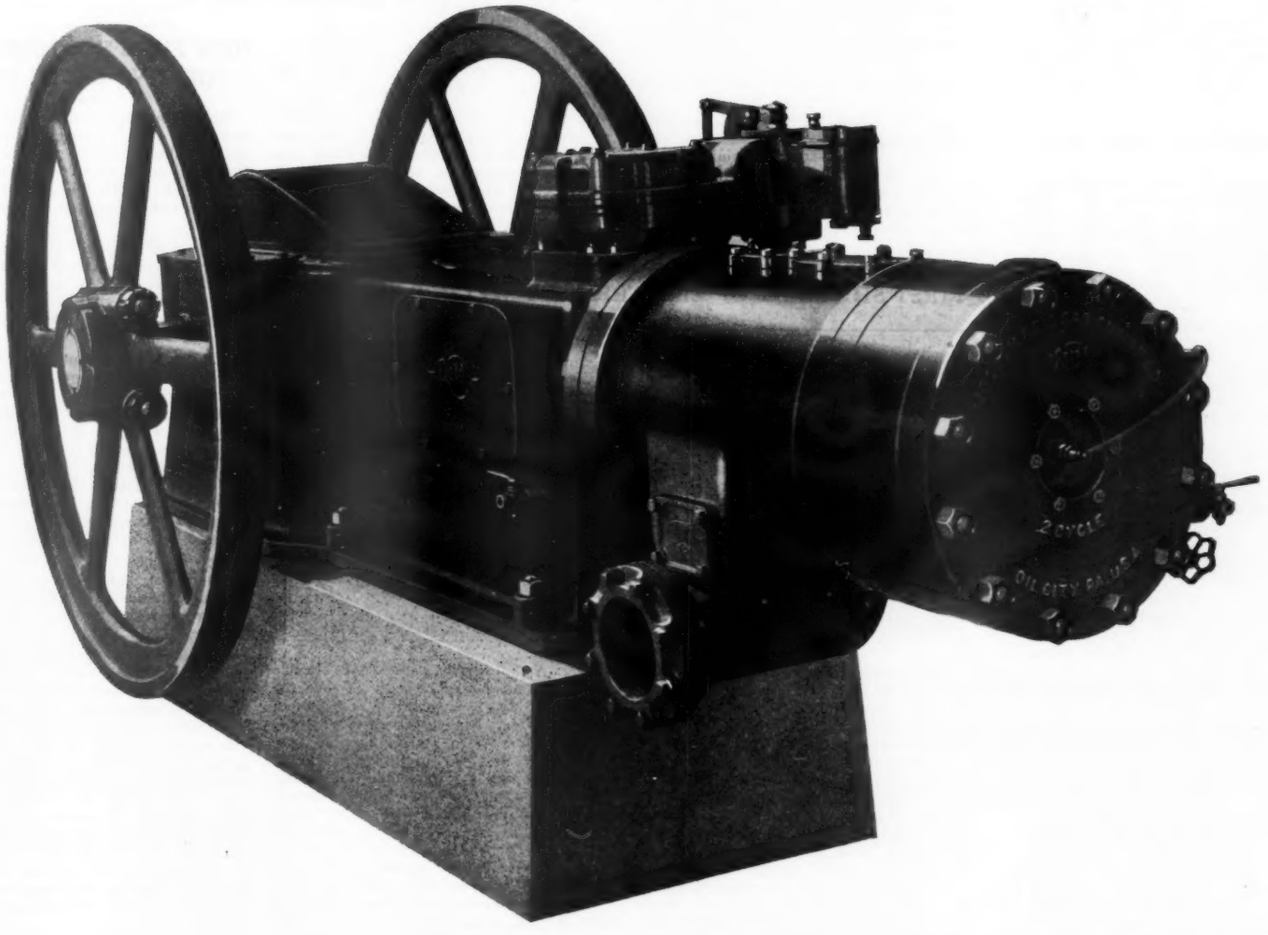
Unprecedented Speed Range

Write any branch or agency for complete information

JOSEPH REID GAS ENGINE COMPANY, OIL CITY, PENNSYLVANIA, U. S. A.

Branches and Agencies: Marietta, Ohio; Newark, Ohio; Shreveport, La.; Charleston, W. Va.; R. B. Moore, Bolivar, N. Y., Frick & Lindsay Co., Bradford, Penna., and Kentucky Distributors; S. R. Shoup, 724 Board of Trade Bldg., Los Angeles, Calif.; Frick-Reid Supply Co., Tulsa, Okla., and Branches, Distributors for Oklahoma, Kansas, Texas, Arkansas and Wyoming.

Export Sales Representatives—Oilfield Equipment Co., 30 Church St., New York City. Branch Shop: Tulsa, Okla.



REID OIL FIELD MACHINERY

EQUIPMENT AND SUPPLIES

Acquires Terminal At Galveston, Tex., For Oil Shipments

The North American Car Corp., of which H. H. Brigham is president, has recently leased from the Missouri, Kansas & Texas Railway, the oil terminal of the latter company at Galveston, Tex.; and through its subsidiary, the Gulf States Terminal & Transport Co. is operating the plant in conjunction with its export terminal at New Orleans, La., which was built last year.

Over 5,000 carloads of oil have been handled thus far in 1927, and current contracts cover various commodities including crude and refined petroleum for export and over 5,500,000 gallons of import molasses. These terminals are operated in connection with the tank car fleet of the North American Car Corp., who also have oil storage facilities at Tulsa, Okla., and Chicago.

VISITED BYERS PLANT

Frank De Luce, district manager of A. M. Byers Co., left last week for Piitsburgh, Pa., and took with him the following guests: Wiley Martin of the Sinclair company, Clyde Layton of the Tidal Oil Co., Emmett Dougherty of the Sinclair company and George Hamnum of the Mid-Continent Petroleum Corp. While in Pittsburgh they attended the World Series and inspected the A. M. Byers mills.

WIGGINS BREATHER ROOF

The Chicago Bridge & Iron Works has issued a booklet describing the Wiggins breather roof, a new device for stopping evaporation from standing oil storage. This company has made arrangements to manufacture the new breather roof as a companion type to the Wiggins floating roof.

The booklet explains that the new roof stops evaporation from standing storage by preventing the escape of air-vapor mixture from the tank.

BOUGHT BY DELTA COMPANY

The Delta Electric Co. of Marion, Ind., on September 15, 1927, purchased the capital stock, patents, good will, etc., of Accessories Manufacturing Co. of Chicago, manufacturers of automobile lamp plugs and sockets, connectors, small lamps, switches, etc. The Chicago company supplies large quantities of this material to the various motor car manufacturers. The Chicago plant later is to be removed to Marion, Ind., and consolidated with the Marion Delta plant.

TO SELL COLUMBIA PRODUCTS

The American Rolling Mill Co. of Middletown, Ohio, has taken over the sale of all products made by the Columbia Steel Co. of Butler, Pa., and Elyria, Ohio.

NOW WITH WORTHINGTON

W. S. Hovis, formerly with the Gardner Governor Co., is now handling the mechanical problems and sales work for the Worthington Machinery Corp. in the Seminole district of Oklahoma.

VISITING MID-CONTINENT

H. A. Platt, assistant superintendent of the Reid Gas Engine Co.'s Oil City plant, has left Oil City for a trip over the Mid-Continent oil fields. Mr. Platt also attended the Tulsa Exposition held in Tulsa.

NEW SULLIVAN COMPRESSORS

The new line of Sullivan high-pressure angle compound compressors, Class "WJ-3," are described as suitable for pressures from 250 to 1,000 pounds per square inch. These are two-stage compressors, the low-pressure cylinder being horizontal, and the high-pressure cylinder vertical, with a vertical intercooler between them. These units are at present available in capacities of 186, 235, and 290 cubic feet per minute. Both gas and air models are available.

"These units have been especially designed, and are at present in use for high-pressure gas and air lift work in the Mid-Continent oil field," a bulletin says, where they are being marketed by the Continental Supply Co. "There are, however, suitable types for any air or gas service within the range of pressures and capacities indicated above. Some units are direct connected to gas engine by means of a flexible coupling; others to Diesel engines or electric motors;—yet short belt or 'texrope' drive from any form of driving unit, such as a motor or gasoline, or steam engine, can be conveniently employed. The compactness and freedom from vibration of these balanced angle compound units, makes them particularly desirable for temporary installations, where it is desirable to save the expense of a permanent foundation."

TRADE LITERATURE RECEIVED

For demonstrating the approved methods of stringing up a traveling block with a crown block a special pamphlet has been issued by Regan Forge & Engineering Co. Describing the various ways of stringing up a 4, 6, 8 and 10-line block and the explanation is made with simple drawings that anyone can understand. It also illustrates by progressive drawings the manner of assembling a crown block on the top of a derrick, and a complete hook-up of a crown block, traveling block, casing hook, rotary swivel, oil saver, tubing head and control head. It also explains the action of wire line as it travels over the various sheaves and the relations of sheave dimensions to the wear upon wire lines. The pamphlet was written and produced to particularly embody the new Regan Crown Block.

Six interesting pieces of literature have just been prepared and released for publication by Wilson Oil Tools Corp. of Los Angeles, describing tongs, elevators and underreamers. One pamphlet features the new Rollover lever embodied in Wilson Casing Tongs, showing how it is operated. Adoption of the Rollover lever in rotary tongs also necessitated new literature for the latter and a special folder has been prepared showing the rotary tongs and listing dimensions. A special pamphlet has also been prepared on the new Wilson Go-Round Tongs used in conjunction with the rotary table for making up and breaking out drill pipe.

CARE OF WIRE ROPE

A. Leschen Wire Rope Co. issues a booklet on "Practical Information on the Use and Care of Wire Rope," which covers the subjects of unloading and moving, storage, breaking in rope (also called setting) kinks and kinking, uncoiling and unreeling, lubrication, stresses, care of idle rope, splicing and many other items of actual use to men who handle wire lines in their daily work.

FIRST SHIPMENT OF ELECTRICALLY WELDED GAS PIPE

What is described as the largest single shipment of pipe ever made, that also is the first shipment of electrically-welded gas line pipe, left Milwaukee, Wis., on September 15, bound for Texas gas fields.

On that date, the A. O. Smith Corp. of Milwaukee shipped the first six train loads of 225 cars of 22-inch gas line pipe for the Dixie Gulf Gas Co. line under construction by the Hope Engineering & Supply Co. from the Shreveport area to Houston and Port Arthur, Tex.

The six train loads represent the largest single shipment of pipe ever made in a single day. It involves 5,625 tons of steel and represents an entirely new departure in the pipe industry. One hundred fifty-eight thousand, two hundred and fifty feet of pipe, just 150 feet less than 30 miles, are in this first shipment which marks the introduction of Smith-steel gas line pipe, announced on May 15 of this year, into actual use in natural gas lines.

The pipe is joined on the longitudal seam by the Smith method of electric welding, and a characteristic is that the purchaser has considerable option in specifying the metal thickness of the pipe.

The process also makes possible production of the pipe in uniform lengths of 30 feet which will reduce materially the number of joints heretofore required per mile. It is made with either plain end or plain end beveled for any type of joint. The pipe mill of the A. O. Smith Corp. is now producing the new pipe at the rate of 4½ miles per day.

Eighteen hundred car loads, of which 225 shipped today are the first, constitute the complete shipments to be made on the present order of the Hope Engineering & Supply Co. for the Dixie line, requiring approximately 50,000 tons of steel to produce. The line will extend from Waskom, Harrison County, Texas, to the Gulf Coast cities. The total length of the line is to be 278 miles, making it the longest line of such a size ever built for transportation of natural gas.

Fulton Iron Works Buys an Interest in The Foos Engine Co.

Harry J. Steinbreder, president of the Fulton Iron Works of St. Louis, Mo., was recently elected chairman of the board of directors of the Foos Engine Co., of Springfield, Ohio. The Fulton Iron Works has acquired a substantial interest in the Foos company, which will permit the grouping of the sales of the products of the two concerns which will, however, retain their separate identities. At the same meeting of stockholders at which Mr. Steinbreder was made chairman of the board, George Foos, son of the founder of the Foos Engine Co., was elected president of the company. He will have active management of the company's big Springfield plant.

The new arrangement will give the two companies a range of products from 10 to 1,500-horsepower engines. The Foos engines run from 10 to 400 horsepower. The Fulton Iron Works is an outstanding manufacturer of big engines from 300 to 1,500 horsepower. The Fulton Iron Works was organized in 1852. The Foos Engine Co. was organized in 1897. Both companies and their products are widely known in the oil and gas industry.

NEW FUEL ECONOMIZER FOR TWO-CYCLE ENGINES

The Bessemer Gas Engine Co. announces a simple mechanical gas injector device which makes possible four-cycle fuel economy with two-cycle engines, retaining all of the features of simplicity which are characteristic of two-cycle power plants.

Instead of taking the gas through the mixing valve and into the combustion chamber through the inlet port, the gas is injected directly into the combustion chamber through a mechanically operated valve in the cylinder head.

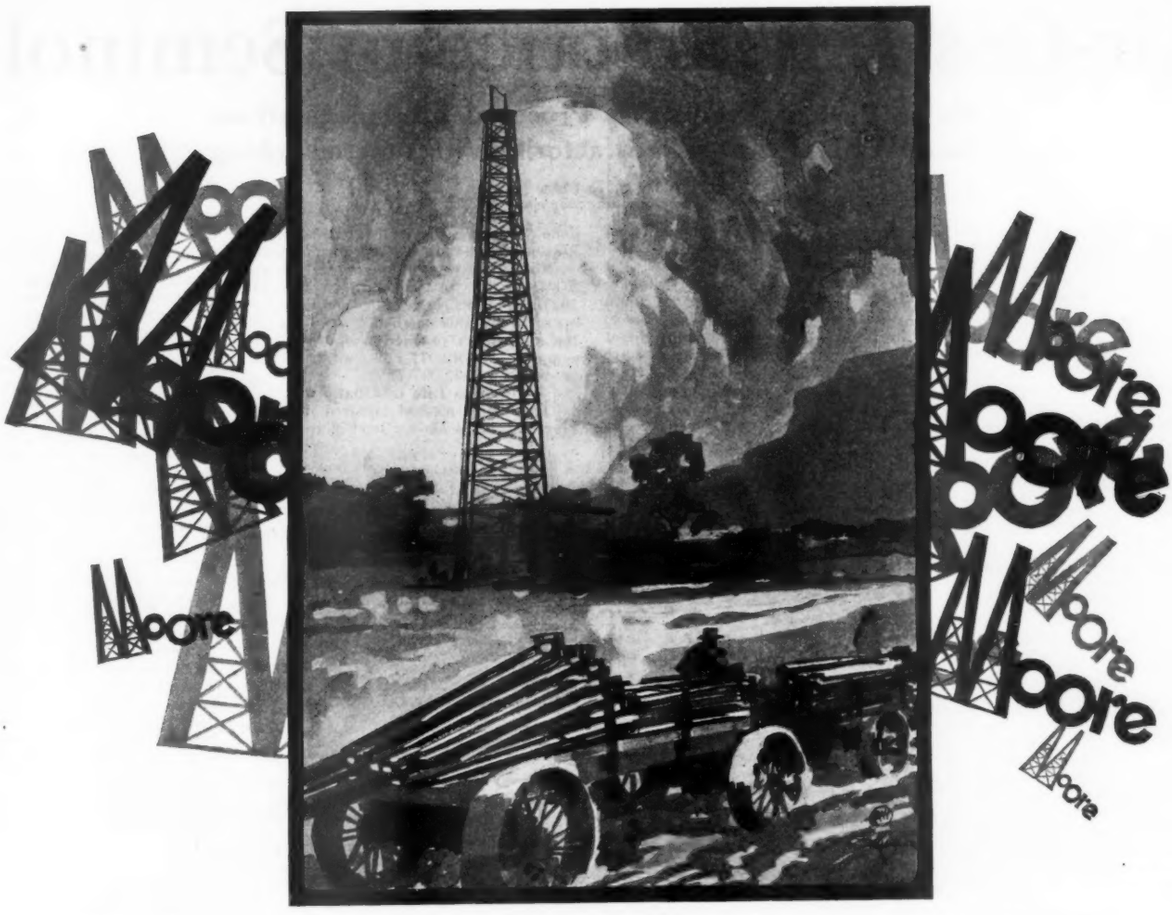
The air is drawn into the charging end of the cylinder and as the piston uncovers the inlet port the air rushes into the combustion chamber and scavenges it with pure air only. As the piston returns on the compression stroke, the valve in the cylinder head is opened, and the gas is injected directly into the combustion chamber at about 15 pounds pressure where it mixes with the air which has already been drawn into this chamber.

The operation of this fuel economizer is unusually simple and with a change in the cylinder head, it can be applied to any Bessemer two-cycle gas engine.

An eccentric mounted on the crankshaft operates a push rod which is connected to a rocker arm and cam device which in turn opens and closes the valve in the cylinder head at the proper time. The mechanism is so timed as to inject the correct amount of gas at the exact point in the stroke to insure maximum engine efficiency and greatest fuel economy. To secure the greatest efficiency the valve can be opened but a short period and must be closed quickly. To accomplish this, a perfected release device is employed which permits the valve to be opened for but 30 degrees of the cycle and closed with an instantaneous snap action.

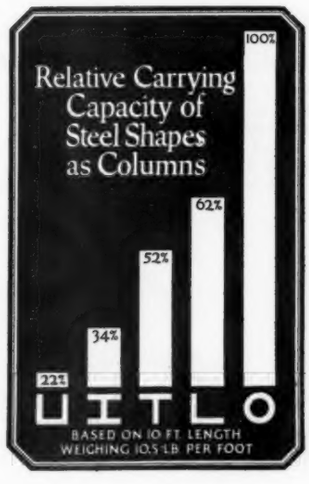
TO DEMONSTRATE PRODUCTS

McGregor Working Barrel Co., Inc., of Bradford, Pa., announces that its representative, N. W. Reed, will make a trip through the principal oil fields of the Mid-Continent demonstrating its products.



Lightest to Ship and Haul

LIGHT weight is important when shipping distances are great or haulage conditions bad. Tubular steel has the lightest weight, strength for strength (compressive load), of any steel shape.



World Wide Service for Twenty Years

While light in weight, Moore Tubular Steel Derricks are powerful and are so simply constructed that all conditions are met and overcome quickly and conveniently. Strength *and* light weight are important Moore Features.

LEE C. MOORE & COMPANY, *Inc.* PITTSBURGH • TULSA

Established 1907

DALLAS, TEXAS CASPER, WYO. HOUSTON, TEXAS SHREVEPORT, LA. WICHITA FALLS, TEXAS EL DORADO, KAN. BORGER, TEXAS PARKERSBURG, W. VA. EL DORADO, ARK.

Air-Gas Lift Practice in Seminole

Major Part of Production Procured by This Method. Small Wells Operated Satisfactorily With Tapered Tubing

By S. F. Shaw*
Consulting Engineer

The first drilling in the Seminole Field was done in 1913. During the next 10 years other attempts were made to discover oil in this field, but no encouragement was met with until March, 1926, when the Indian Territory Illuminating Oil Co. completed No. 1 Dyer in the Hunton lime for 1,100 bbls. On July 16, 1926, the Independent-Garland interests discovered oil in the Wilcox formation when No. 1 T. Fixico came in at 4,055 feet and on September 9 reached a peak of 8,040 bbls. On August 1 the daily production of the pools making up the Seminole district amounted to slightly over 500,000 bbls., practically all of which is coming from the Wilcox formation.

The Hunton formation has not been very productive of oil, but has maintained a fairly high gas pressure; this formation has been encountered at from 3,800 to 4,200 feet, below which there is about 100 feet of Sylvan shale. The shale is underlain by 75 feet of Viola limestone in which formation oil in a few places has been encountered. Below the Viola lies the Upper Simpson formation in which is found the Wilcox sand. The depth of the Wilcox in the Seminole Field varies from 3,900 to 4,500 feet. Initial production in the Wilcox has reached as high as 12,000 bbls. The gravity of this oil is about 41 degrees Baume.

The general practice is to set 6⅝-inch casing above the Wilcox and drill in, though in several cases 5⅛-inch casing has been set for the oil string, and in a few cases, casing as small as 4¾-inch has been employed.

Production Statistics

Production for the Seminole district for the various months since its discovery is shown in Table No. 1.

TABLE NO. 1
Production in the Seminole Field by Months

1926	
March	24,696
April	33,830
May	24,481
June	85,790
July	194,124
August	427,366
September	644,824
October	1,919,225
November	3,312,281
December	4,250,608
Total	10,917,225
1927	
January	5,639,938
February	7,028,950
March	9,706,689
April	10,010,250
May	10,964,793
June	11,506,140
July	14,711,087
Total	69,567,847

Production of the Carter Oil Co. in the Seminole Field up to August 1, 1927, is shown in Table No. 2.

TABLE NO. 2
Production of the Carter Oil Co. in the Seminole Field

1926		
July		1,550.40
August		67,249.18
September		44,374.09
October		62,154.82
November		149,813.98
December		569,881.11
Total 1926		895,023.56
1927	**Ttl. Bbls.**	**Air Lift**
January	920,428.83	35,007
February	1,252,191.23	739,931
March	1,565,330.00	987,922
April	2,461,749.08	1,267,472
May	2,332,499.73	1,098,644
June	2,305,642.84	1,236,440
*July	1,981,537.50	1,276,870
Total 1927	12,819,379.21	6,665,948

*Estimated.

The relative importance of the air-gas lift in the Seminole Field can best be realized by referring to Table No. 3. It will be noted that of the total production of 411,000 bbls. on June 27, 1927, there was produced by air-gas lift 275,000 bbls., or approximately 67 per cent. The air-gas lift production in Seminole alone on June 27, 1927, was approximately 11 per cent of the daily average production of the entire United States.

*At midyear meeting Petroleum Division, A. I. M. E., Fort Worth, Tex.

Compressor Plants

Two general types of compressors are in use in this field, one being a small electric or gas-motor driven compressor, the other is a larger type usually direct driven from gas engines, though there are a few installations of the larger type driven by belts from gas engines.

The sizes and makes of compressors of the small type mostly employed are as follows:

Manufacturer—	Size	Cu. Ft. Displacement	R. P. M.
Ingersoll-Rand	9½ x 4 x 10	243	300
Ingersoll-Rand	10 x 4¼ x 10	270	300
Chicago Pneumatic	10 x 4¼ x 10	242	275
Worthington	10 x 4¼ x 12	270	250

Makes and sizes of the larger types of compressors mostly employed in this field are as follows:

Manufacturer—	Size	Cu. Ft. Displacement	R. P. M.
Bessemer	9¾ x 5 x 20	311	180
Bessemer	13½ x 6¼ x 20	585	180
Bessemer	14¼ x 6½ x 20	653	180
Clark Bros.	14 x 7¼ x 20	...	...
Clark Bros.	15 x 7½ x 20	...	...
Cooper	14½ x 7½ x 20	...	...
Cooper	16 x 7⅝ x 20	...	...
Cooper	10 x 5½ x 20	...	...
Ingersoll-Rand	15 x 6⅝ x 16	486	150

At the end of July, 1927, the various plants of the Carter Oil Co. consisted of the following compressors:

Make—	Size	No. of Compressors	How Driven
Ingersoll-Rand	9½ x 4 x 10	185	100-h.p. electric motor
Ingersoll-Rand	10 x 4¼ x 10		
Chicago Pneumatic	10 x 4¼ x 10	2	75-h.p. electric motor
Worthington	10 x 4⅝ x 12	4	100-h.p. electric motor
Bessemer	13½ x 6¼ x 20	58	165-h.p. gas engine; direct

The Ingersoll-Rand compressor driven by electric motor have been found to be the more satisfactory, owning to the greater flexibility and dependability of this type of compressor, particularly in the early stages of air-gas lift operations. After pressures have declined to a low point, and it was desired to operate the wells by gas rather than by air, the Bessemer compressors driven by gas engines have been found to be quite serviceable, and the cost of compression per 1,000 cubic feet of gas or air is considerably less than when using the electric motor-driven type.

Air-Gas Lift Operations of the Carter Oil Co.

The first well of the Carter Oil Co. to be operated by air lift was No. 1 B. Carter, which was placed on air lift on October 22, for testing purposes. A 5-foot by 15-foot trap was placed close to the well, and an increase of about 50 per cent was obtained. This work was done with two Ingersoll-Rand 8-inch by 3¼-inch by 8-inch portable compressors.

Other wells were placed on air and gas lift from time to time until on June 30, 1927, 63 wells had been equipped and operated by this method. On June 30, the air-gas lift production of the Carter company was 42,077 bbls. out of a total production of 72,297 bbls.

Air-Gas Lift Installations

The general method followed in equipping a well is shown in Figure 1. In the early stages of production when the wells were large producers, the general arrangement at the top of the well that was found to be most serviceable is shown in Figure 2. The practice was adopted of equipping each well with input and output meters. The general arrangement of pipe connections for the output meter is shown in Figure 3. All of the wells equipped as above noted had the air-gas tubing lowered inside the casing, and the oil was lifted through the annular space between the casing and the tubing. After the wells had declined in production to from 400 to 100 bbls., a string of tapered tubing was inserted in the well and the oil flowed through the tubing in order to economize in the use of compressed gas. The arrangement at the top for starting wells with high pressures when using tapered tubing is shown in Figures 4 and 5. Three types of complete top arrangement for wells of the Carter Oil Co. are illustrated in Figures 6, 7 and 8. Traps were placed close to the well, and all right-angle bends feasible to remove were eliminated, as was done at Tonkawa and Braman last year, which resulted in notable increases of production. It became the practice of the Carter Oil Co. to equip wells flowing naturally with trap in this manner, and in four cases, increases of 2,000 bbls. per well per day or more were obtained by this change alone without the aid of compressed air from the compressors. It should not be assumed, however, that placing the trap close to the well will always result in increased production, since this will be governed largely by the conditions obtaining for each individual well.

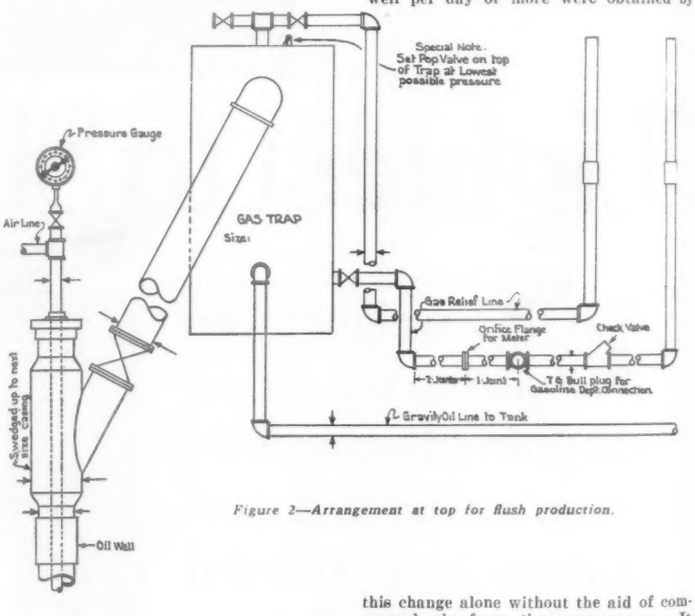


Figure 2—Arrangement at top for flush production.

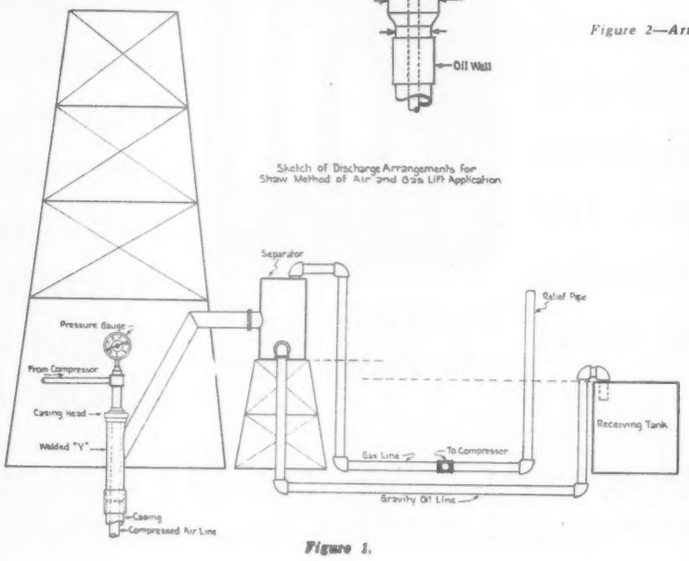


Figure 1.

In the early stages of operation where several wells were operated from one compressor station, a manifold header was employed. Later, when it was desired to operate the plant with volumetric control on small wells, the control meters were connected up through the same manifold as shown in Figure 10. In this way every desired degree of flexibility was provided for, in starting and operating the various wells.

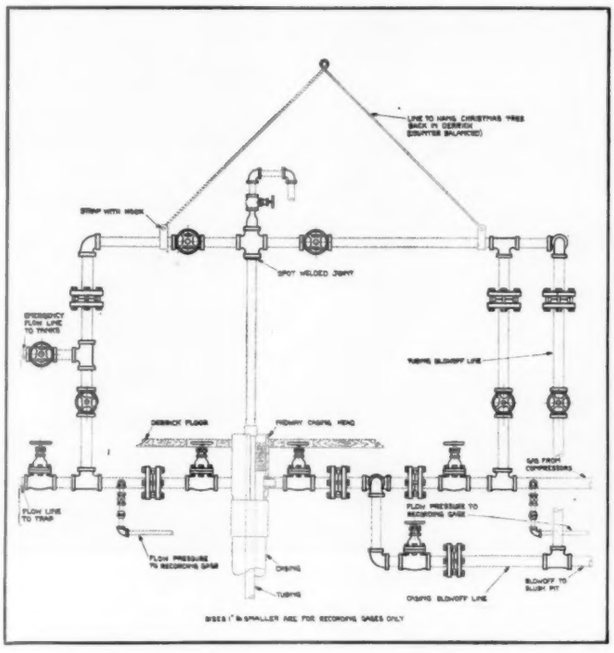
Depths of Wells and Pressures Employed

Depths of wells have averaged about 4,100 feet. Highest pressures in starting were about 1,000 bbls. per square inch and since the small compressors are built for this pressure no trouble was encoun-

150 Pounds Pressure

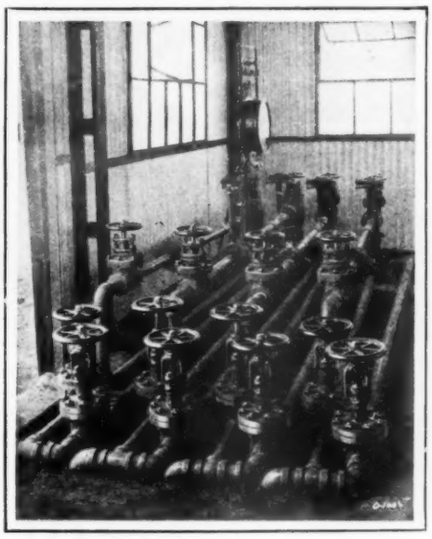
CRANE VALVES

2500 Pounds Pressure



A typical Christmas Tree hook-up in an air-gas lift station

View of the air-lift station of the Minnehoma Oil and Gas Co., Bowlegs, Okla. Valves and fittings were supplied by Crane Co.



In the air-lift station at Bowlegs

When oil men congregate in the mid-continent field, Crane materials need no press agent. Crane Co. has served these experienced field men for so many years, in so many different ways, that the very word Crane has come to mean valves and fittings—dependable valves and fittings.

On the Lizzie Bowlegs Lease, at Bowlegs, Okla., is one of the many Crane installations in the Oklahoma fields—the air-lift station of the Minnehoma Oil and Gas Company. It is representative of a score of others.

If you have need for air-gas lift equipment, you too can profit by consulting Crane Co. For this important service, as for every other gas or oil need, the Crane line is complete, including materials of cast iron, bronze, malleable iron, ferrosteel, cast and forged steel, for pressures from 500 to 1200 pounds. A letter will bring full information.

CRANE

Address all inquiries to Crane Co., Chicago

GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVENUE, CHICAGO

Branches and Sales Offices in One Hundred and Sixty-two Cities

National Exhibit Rooms: Chicago, New York, Atlantic City, San Francisco, and Montreal

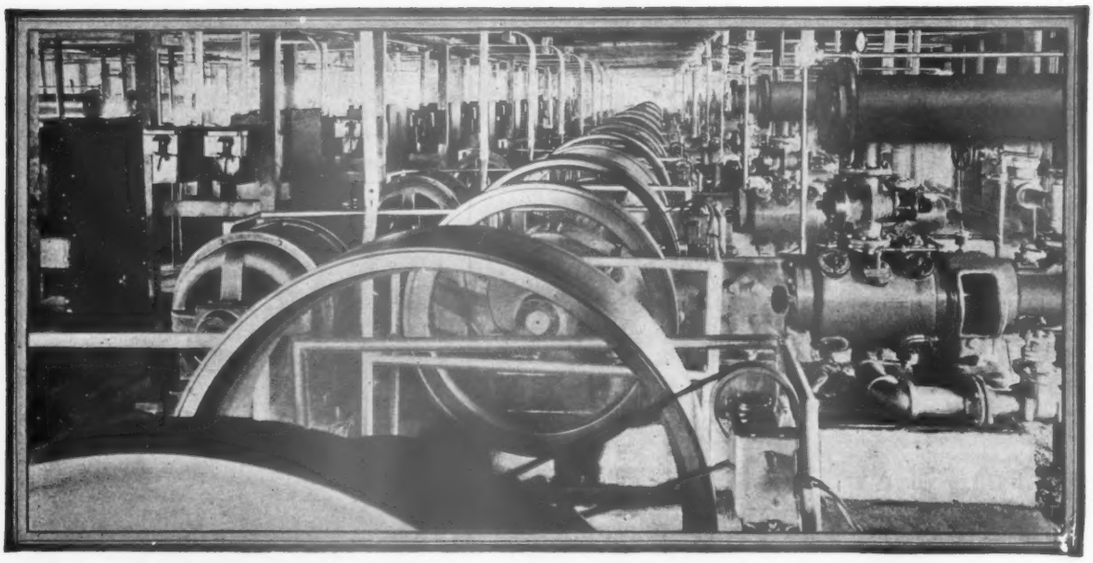
Works: Chicago, Bridgeport, Birmingham, Chattanooga, Trenton; Montreal, and St. Johns, Quebec; Ipswich, England

CRANE EXPORT CORPORATION: NEW YORK, SAN FRANCISCO, MEXICO CITY, HAVANA

CRANE LIMITED: CRANE BUILDING, 1170 BEAVER HALL SQUARE, MONTREAL

CRANE-BENNETT, Ltd., LONDON

Cie CRANE: PARIS, BRUSSELS



24 CP High-Pressure Compressors, (Class N-CTB) Flowing Wells in Seminole Field

CP Air and Gas Compressors for Oil Field Service

YOU can secure a CP Compressor to meet any oil field requirement. They are available in a wide range of types and sizes, for operation by Oil, Gas, Steam, Belt and Electric Motor, in either Stationary, Semi-Portable or full Portable units.

The remarkable records made by CP Compressors in oil field work, together with the unsurpassed performances of thousands of units in industrial work, speak for themselves.

If you have wells to flow, or require compressors for any purpose, let our oil-field engineers confer with you. They have had a wide experience.

Oil Field Equipment

Compressors for flowing oil wells.
Vacuum Pumps, Condensers, and Compressors for refinery service.
Gas Compressors for pressure boosting.
Diesel Engines 80 to 450 h.p.
Gas Engines 90 to 540 h.p.
Portable Oil and Gas Engine-Driven Compressors for cleaning wells and tank farm work.
Pneumatic Riveters, Chippers, Caulkers, Scalers, Drills, Reamers and Grinders for every portable tool job.

C-261

Chicago Pneumatic Tool Co.

Sales and Service Branches all over the World

6 East 44th Street, NEW YORK, N. Y.

Wealton & Townsend Co., Inc., *Authorized Distributors*

Higgins Bldg., Los Angeles
210 So. Jefferson St., Dallas
120 East Brady St., Tulsa
1415 Fannin St., Houston

tered in meeting these high pressures. High pressure fittings are employed altogether. The highest working pressures were about 450 pounds which, of course, declined gradually with the age of the well. The lowest pressure employed was about 50 pounds on a small well making about 10 bbls. per day, equipped with a string of tapered tubing.

Back Pressures

In some fields it has been of advantage to use "beans" or "chokes" in the flow line, thereby securing a high back pressure and for a short time conserving gas, but it was found at Seminole that the wells in many cases would cease to flow where any form of back pressure was applied. The lowering of a string of 2-inch or 2½-inch tubing caused many a large well to cease flowing. The use of a bean is of advantage only where pressures are high, this causing the well to act more in the nature of an artesian flow rather than as a gas filt. In this case the fluid level stands very high and the oil is "squeezed" through the bean; production is greatly reduced. As soon, however, as the pressure has declined and the fluid level reduced to a point where the well is acting mainly as a gas-lift, a bean causes the gas-oil ratio to increase to a high point. This effect is clearly shown by the results of the work of the Shell company at Dominguez, Calif. The same effect of conserving the gas can be secured by employing the proper size of tubing through which to flow the well, and the gas-oil ratio does not then increase to excessive points then the fluid level is lowered.

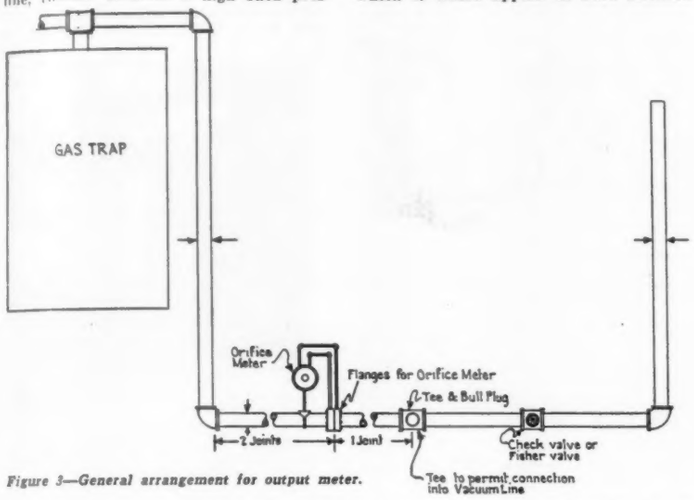


Figure 3—General arrangement for output meter.

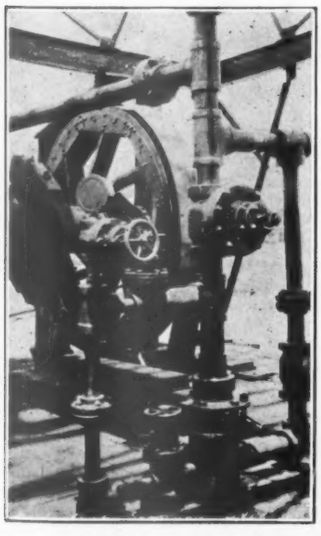


Figure 5—Arrangement for starting well flowing through tubing when under high pressure.

Examples of Air-Gas Lift Wells

The graph in Figure 11 shows the production curve of No. 2 Grisso well in the Seminole Pool, arranged in averages of 10-day periods. This well was one of the early wells of the Carter Oil Co. to be placed on the air lift. Up to June 30, this well had produced a total of approximately 585 000 bbls. The production curve shows a drop from the normal between the dates of February 16 and 28, caused by curtailment of production. It will be noted that then the well was again operated at maximum capacity the curve was restored only to the point at which it would appear to have declined had there been no curtailment, hence there was a loss of production of approximately 20,000 bbls. from this well during that period. The lower end of the production curve tends to flatten, and it is possible that a fairly well-settled production can be expected from this point unless there is an encroachment of water which would cause a rather sudden drop. The input pressure, starting at 410 pounds per square inch, has declined as was to be expected. The gas lift factor has shown a rather rapid rise in cubic feet per barrel of output gas from the well toward the last periods noted. The gas-oil ratio, obtained by subtracting the input gas per barrel from the output gas per barrel, shows a fairly regular increase to May 27, when it began to decline. It has been noted on some occasions that this decline in the gas-oil ratio indicated the approach of water encroachment. The decline in the gas-oil ratio must, of course, be made up by input gas in order to maintain the maximum production of oil from the well.

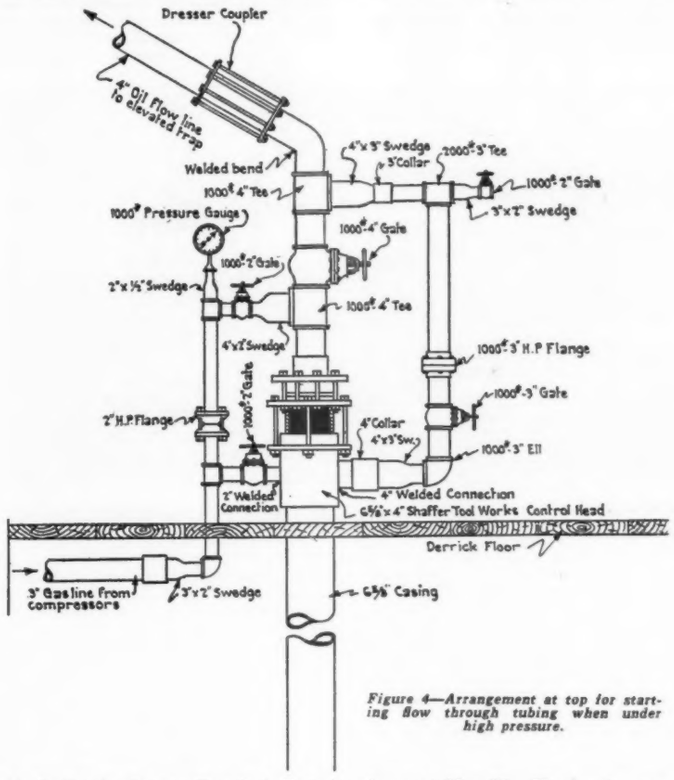
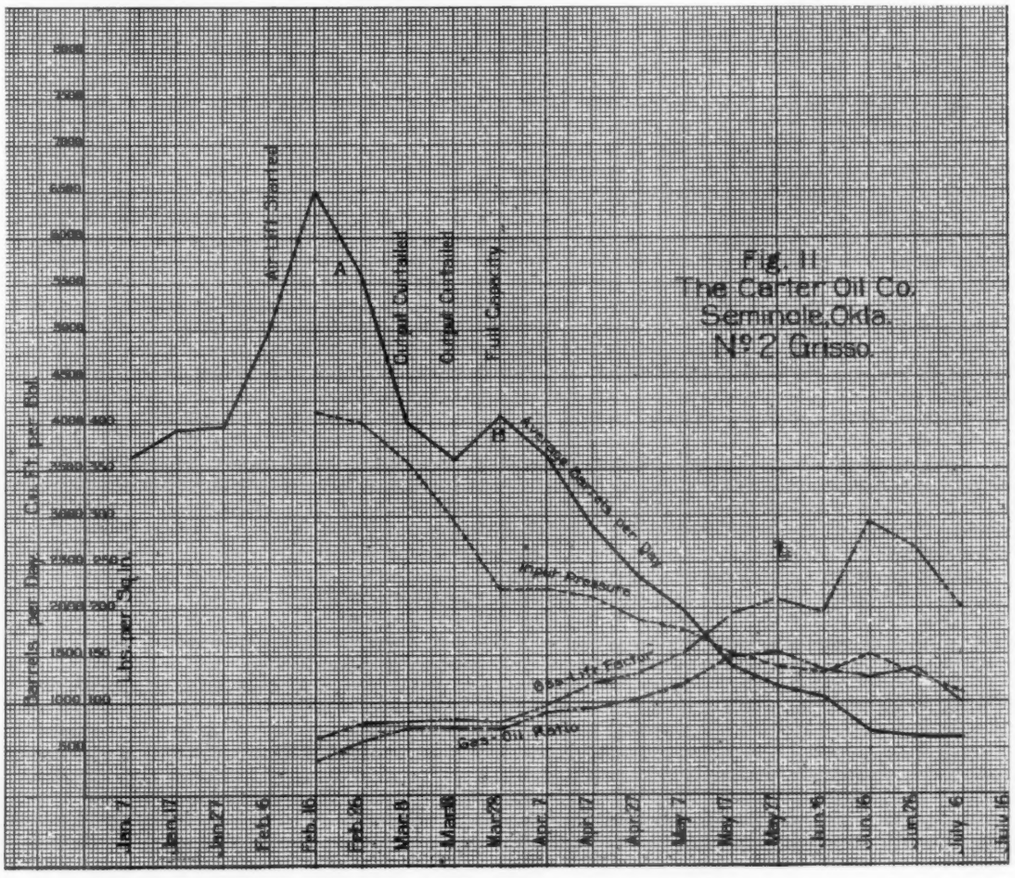


Figure 4—Arrangement at top for starting flow through tubing when under high pressure.

Figure 12 contains curves of the various data for No. 1 Bowlegs well in the Bowlegs Pool. The sudden drop in the early stage of production appeared to be a natural decline; the well was shot, after which the curve rose to the point shown at May 29. The input gas pressure has not declined greatly as yet, and the gas-oil ratio has held at a fairly low point, that is, under 500 cubic feet per barrel, which is one of the lowest gas-oil ratios at any of the wells of the Carter Oil Co. in the Seminole district. The



gas lift factor has been rather low, though on July 8 there appeared to be a tendency toward an upward bend in this curve. A test was run on this well on May 27, and the best operating effficiency was found to be 21 per cent.

Small Wells Operated by Air-Gas Lift

Considerable difficulty has been experienced in pumping small wells on the

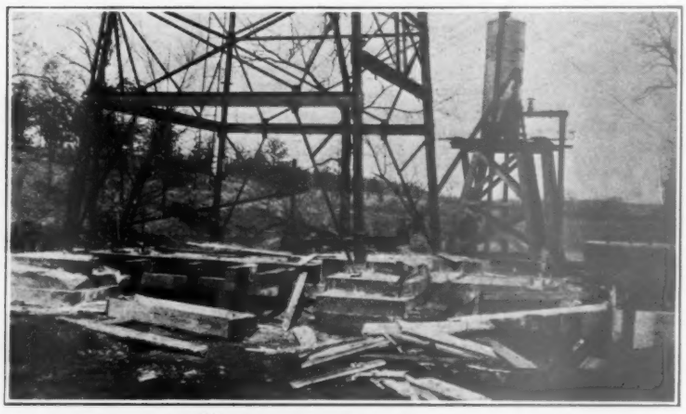


Figure 6—Type of arrangement on Carter Oil Co.'s No. 2 G. F. Killingsworth, Seminole Field, flowing between tubing and casing.

beam in the Seminole Field, and the writer was requested to determine whether these wells could be operated by means of the air-gas lift. Two wells were equipped with tapered tubing to determine whether this was practicable. The results were quite satisfactory and subsequently several other wells were equipped in this manner with fully as good or better results than for the first wells. One well as small as 10 bbls. per day was operated very satisfactorily, and several wells ranging from 20 to 350 bbls. are now being flowed in this manner. The quantity of oil lifted per day was not increased except in one instance, but the quantity of gas sent to the well has been reduced to about one-half the consumption formerly employed when lifting between the tubing and casing. As wells become smaller in production, the pressure drops, the lift increases, and the quantity of gas required to lift a barrel of oil is greatly increased over that necessary for a large well, and this quantity increases to an abnormal extent if the lifting be done through the same eductor as when flowing a large well. A consumption of 50,000 cubic feet per barrel, could easily be reached in flowing a 10-bbl. well through the annular area between the 2 or 2½-inch tubing and the 6⅝-inch casing, whereas a proper size of taper tubing would operate on 10,000 cubic feet per barrel or less, at 50 pounds pressure per square inch, when flowing a well of this size.

The conditions of pressure, or submergence of lift, quantity of fluid and quantity of gas accompanying the oil have a close bearing on the proper design of tapered tubing, and unless a nearly correct design is obtained it is best not to use this method of tubing since the quantity of gas consumed per barrel of oil may become excessive and production may be considerably reduced.

Figure 7—Arrangement of Carter Oil Co.'s No. 3 Vicison, Seminole Field, when flowing between casing and tubing.

When small wells are operated by gas lift, the lifting costs become a matter of great importance. If the small electric-driven compressor that was employed for high pressures be employed for small low-pressure wells, the cost per 1,000 cubic feet of compressed air or gas will probably reach 7 or 8 cents, and at 10,000 cubic feet per barrel the cost would reach 70 to 80 cents with no allowance for interest or depreciation. On the other hand, gas can be compressed in a compressor direct driven from a gas engine at a cost of 3 to 4 cents per 1,000 cubic feet and the lifting cost then becomes 30 to 40 cents per barrel which is considerably lower than would be the cost of a well on the beam, where frequent stoppages are caused by rod breakage, leaky valves, etc. We have operated a small well by compressor for 60 days without loss of production for a single day. If now we consider the cost of lifting oil in a well of

Figure 8—Arrangement of Carter Oil Co.'s No. 1 Grisso, Seminole, flowing through tapered tubing.

100 to 200 bbls. per day, total depth of 4,000 feet operated by air lift and equipped with tapered tubing of proper design, we would have a gas input consumption of about 2,500 cubic feet per barrel, which at 3 to 4 cents per thousand would be 7½ to 10 cents per barrel, and there would be very infrequent loss of production due to stoppages.

It has been demonstrated that with

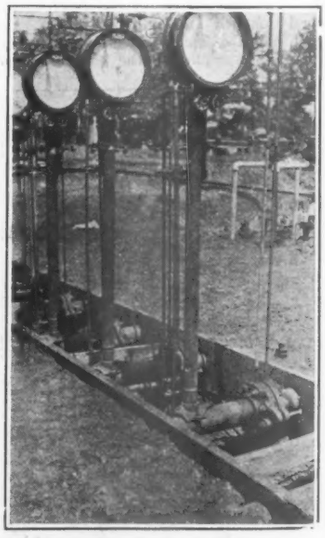
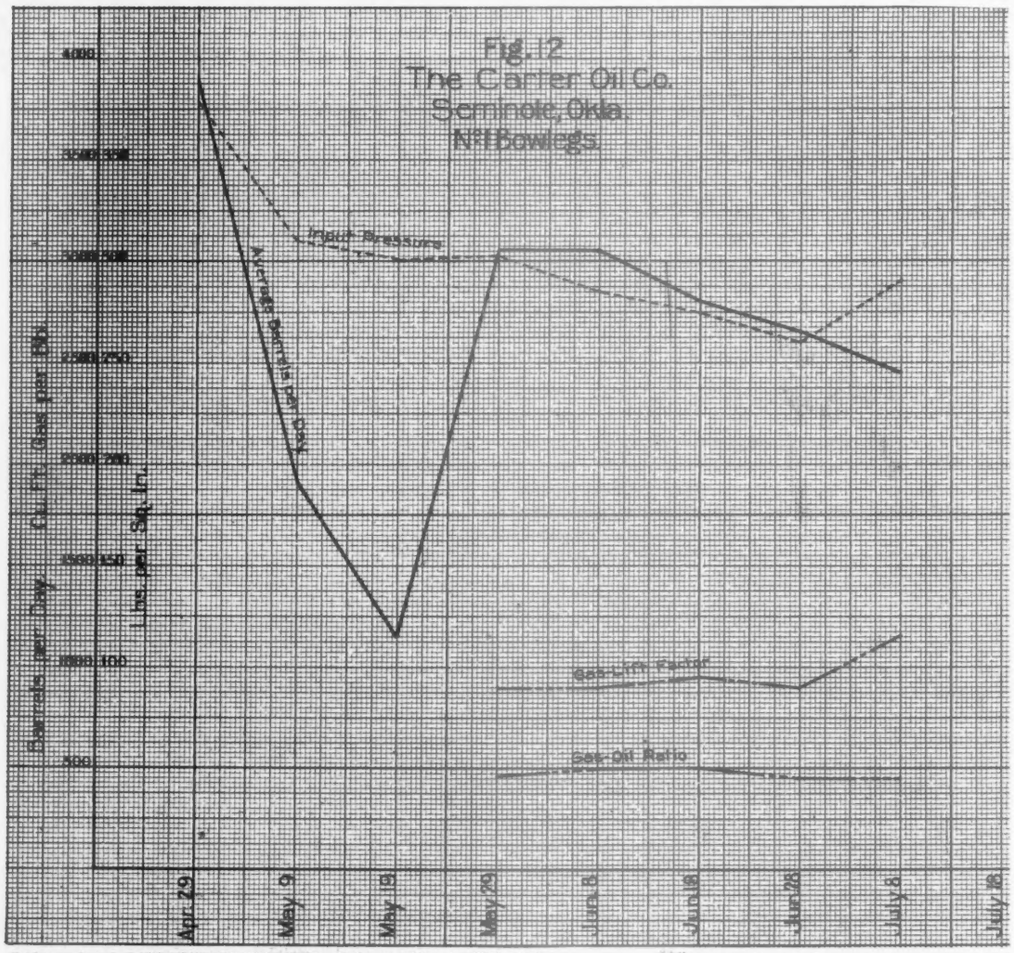


Figure 10—Volumetric control meters connected to manifold.

efficient design of air-gas lift, wells can be increased much beyond the production obtained in the former type of air lift employed; also that small wells can be operated by air lift with tapered tubing at a cost that places this method in competition with beam pumps in many fields. The next step in conservation that the writer expects to have an opportunity to demonstrate is that of restoring the pressure in a pool and producing by air-gas

(Continued on Page 127)



Did You See The *Sullivan Gas Lift Compressors?*

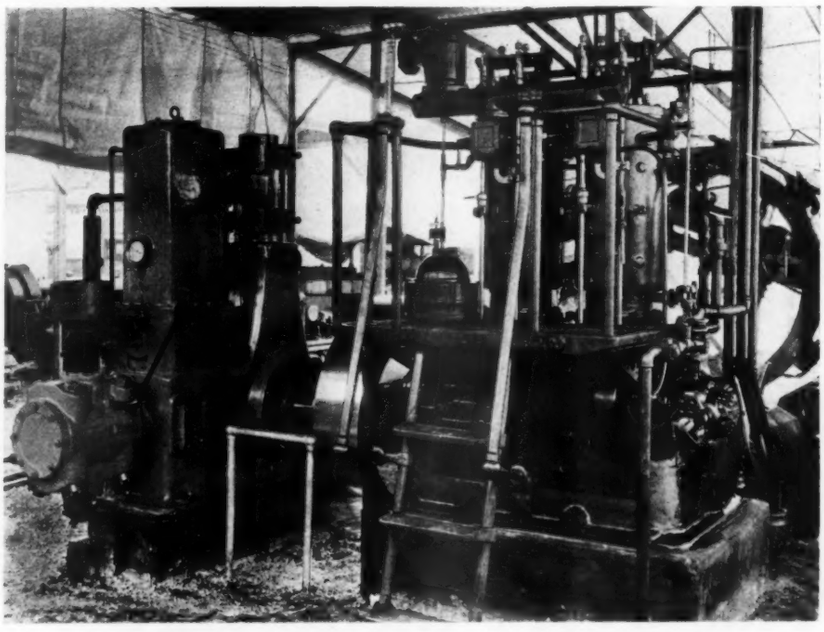
Skid-Mounted Angle Compound Gas Lift Compressor, operating in mud, impressed oil men at the International Petroleum Exposition

Sullivan Angle Compound Gas Lift Compressors at the recent Petroleum Exposition in Tulsa, impressed on oil men the fact that these machines are especially for oil field service. A feature of particular interest was the skid-mounted compressor, operating in the mud, and maintaining a pressure of 500 lbs. It was driven by Tex-Rope Belt from Fairbanks-Morse electric motor.

Another Angle Compound was also exhibited, direct driven from a Foos Gas Engine.

The Sullivan Angle Compound Gas Lift Compressor is a newly designed machine, embodying all the advantages of Sullivan Angle Compound Compressors, but adapted to the special requirements of oil field service.

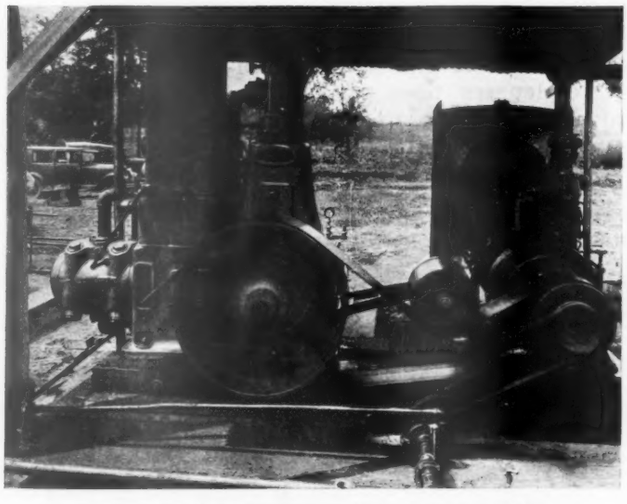
It is available in a range of capacities and pressures suited to the varying field requirements. It is built extra-rugged to stand continuous service and the overload conditions frequently encountered. It is compact (due to balanced angle design) and can be mounted on skids and quickly transferred to new locations. It is adapted to belt drive from motor or gasoline engine, and direct drive from Fairbanks-Morse Diesel Engine, Foos Gas Engine, or synchronous motor.



Sullivan High Pressure Gas Lift Angle Compound, Direct-Driven from Foos Gas Engine—at the International Petroleum Exposition.

Outstanding advantages of the Angle Compound Compressor are small floor space, small and light foundations, and correspondingly low installation cost, adaptability to varying forms of drive, low power cost per unit of gas or air compressed, low cost of maintenance, reduction of care and attendance, and accessibility.

Send the coupon for complete information.



Sullivan Gas Lift Compressor in the Seminole Field. Drive is by belt from gasoline engine.

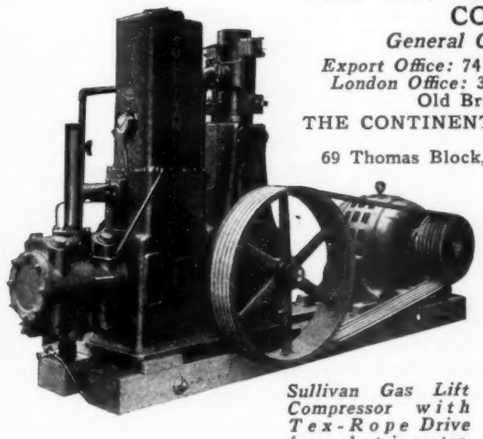
"If CONTINENTAL Sells It, There Is No Better"

THE CONTINENTAL SUPPLY COMPANY

General Offices: St. Louis

Export Office: 74 Trinity Court, New York
London Office: 316-317 Dashwood House, Old Broad St., E. C. 2

THE CONTINENTAL SUPPLY COMPANY, Ltd.,
69 Thomas Block, Calgary, Alberta, Canada



Sullivan Gas Lift Compressor with Tex-Rope Drive from electric motor.

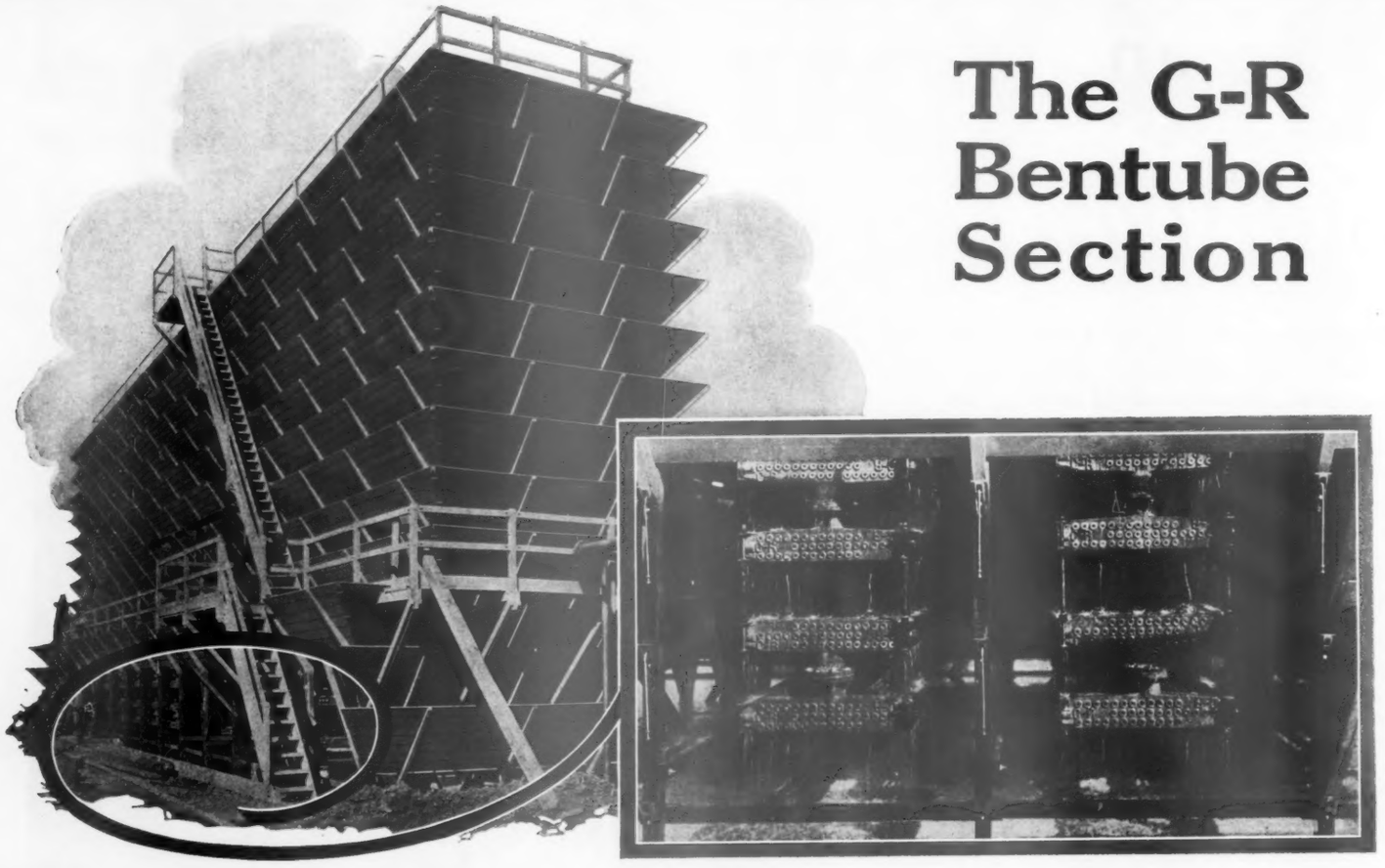
Use the Coupon~

CONTINENTAL SUPPLY CO.
1501 Locust St.,
St. Louis.

Send me full information on Sullivan Angle Compound Compressors for Gas or Air Lift.

Name .....
Street .....
City .....
State .....
Position .....

CONTINENTAL



The G-R Bentube Section

"Has every advantage"

for cooling oil, gas or jacket water —or condensing gasoline

THIS installation of G-R Bentube Atmospheric Coolers operating in conjunction with a Fluor Tower at the West Coast Refining Co. plant in California was described in a recent article as

> "a combination that has every advantage from the standpoint of standardized construction, ease of construction, portability and mobility, and uniform results in operation."

G-R Bentube Coolers are standard and interchangeable, consisting of units of Admiralty metal tubes connected to cast iron headers. These units can quickly be set up in banks and moved about the plant as required by operating conditions.

A unique advantage of the patent G-R Bentube Section is its scale-shedding feature, which permits definite guarantees of capacity to be made even with bad quality cooling water.

Although the design and construction of G-R Bentube Sections are far superior to that of other atmospheric coolers and condensers, their price is surprisingly low because of the large quantities in which they are built. Shipments can be made immediately.

Write for ratings, prices and complete information on special features.

THE GRISCOM-RUSSELL CO.
285 Madison Ave., New York
Branches in principal cities

Griscom-Russell
Heat Transfer Apparatus

HEAT EXCHANGERS
CONDENSERS
Sub-cooling—Partial—Reflux
COOLERS
Liquid—Gas—Jacket Water
OIL HEATERS
LEVEL CONTROLLERS

Mechanical Apparatus for Air-Gas Lift

Arrangement of Machinery and Layout of Pipe in Plants Constructed in Seminole Field Shown and Described

By J. L. Dwyer

With the rapid expansion of the air-gas lift system of flowing oil wells naturally has come an added interest in this method of obtaining oil from the deep sands. The lift has completely revolutionized the business of oil production, and has come in for a good share in the literature of the industry.

Although volumes have been written about the lift, the writings have been more or less technical in nature, and little information has been available regarding the mechanical details of the air-gas lift plant. The chart accompanying this story will at a glance show the position and layout of all the apparatus for gas distribution and power, and also displays the location of the control meter and its accessories.

Many of the articles which have appeared have been suggestive of the attitude of the school teacher who greeted a class of students beginning the mysteries of trigonometry, and opening the textbook said to them, "We'll skip the first 50 pages of this book, for you all know that much about it."

The average reader is acquainted with the fact that the air-gas lift system is primarily a matter of physics. It is operated on the principle of expanding gases. Air or gas (gas is more commonly used) is compressed to a predetermined pressure, and through a series of pipes is sent to the well head, and introduced into the casing or the tubing as the individual case may require. The gas is released at a point near the bottom of the hole, and the gas globules mixing with the oil globules expand and as they expand help to lift the oil. The working energy of the gas does the work of lifting.

Mechanical Apparatus

The accompanying drawing will afford the man far from the field an adequate idea of the position of all the mechanical apparatus, and it may give to some engineers a thought towards pipe economy, for this particular plant layout was designed with a thought toward economy of pipe. In spite of all the air lift plants which have been constructed in recent months, there is still a sharp division of opinion as to the most practical and most advantageous layout for the equipment. The type plant shown in the drawing has been constructed on several leases in the Seminole Field, which has been the scene of the world's greatest air lift activity.

Starting with the gas engine, which is the source of power for most of the plants in the Seminole area, the plant illustrated shows four 90-horsepower gas engines driving four gas compressors. The engines are shown at the bottom, and the compressors are above them on the drawing. The four-unit plant shown is a size which may be used for the average lease. The engines are water cooled, and the cooling water comes from a combination tower and tank which is placed sufficiently high above the engines to permit the cooling water to flow by gravity to the engines eliminating any need for pumps on this operation. The water lines are shown in the headers at the end of the plant. The headers are shown leading into the engine and compressor which comprise the unit at the right of the drawing. Each unit is similarly equipped with lines, although they are not inked in on the drawing, for fear of confusing the eye.

Compressors

The compressors are equipped with similar water intake lines, and outlet lines but of a smaller size. The water intake and outlet lines on the engines are of 8-inch pipe, while the lines on the compressors are 6-inch size. The water circulation necessary for this system is provided by the gravity flow of water into the engine and compressor cylinder jackets, and from the cylinder jackets, it again gravitates into the water outlet headers which run parallel to the sides of the plant building.

The water after passing through the cylinder jackets passes into the outlet lines, and is carried to the hot well shown on the drawing. The hot well is dug much lower than the plant flooring, and the water is gravitated into this well which is a large pit usually lined with concrete. From the hot well the circulation water is picked up by the centrifugal pump shown between the engine and compressor of the unit on the right. This centrifugal pump picks up the water and transports it to the cooling tower through which it drops down into the water tank. This is the only pump necessary for the water system of the entire plant. From the water inlet headers to the engine cylinder jackets the inlet pipes are 2-inch size, and the water outlet pipes are 3-inch size. In considering this system it must be remembered that an adequate number of valves must be provided to permit the water being shut off from any individual engine or compressor without interfering with the movement of water to the other machines.

The gas inlet and outlet headers for the plant are situated parallel to the water inlet and outlet headers. The fuel gas header for transmitting the gas to the engines is placed on the side of the plant nearest to the intake apparatus and distributed through this line. On the compressor side of the plant, the gas to be used in the flowing process is taken in and run through an intake scrubber which removes any impurities and cleanses the gas in order to prevent the introduction of any foreign matter to the well and to the oil sand. From the intake scrubber the gas enters the gas intake header which runs along the compressor side of the plant. It leaves the header (which is generally a 10-inch size) through 6-inch leaders and enters the compression chambers to be compressed to the required figure. After the gas is compressed, it leaves the compressor and runs through a pipe to the control house, which is situated adjacent to the main plant. At the control house the gas runs through an automatic control (if it be a mechanically controlled plant) and enters the lead line which runs directly to the well. The control house machinery is displayed in the drawing and only one line has been completed for convenience. For the four-unit size plant, four connections have been broken into the line but only one has been sketched completely. There are two lines for each unit, one for the intake gas and one for the outlet gas. Both gases are measured, and a permanent record kept of the volume of both. After leaving the control house the outlet gas enters the outlet scrubber which again purifies this gas and removes any foreign matter which may have been accumulated on its journey.

When the gas and the oil it has lifted leave the casing head the common practice is to have a gas separator placed very close to the well and in this piece of equipment the oil and gas are separated, the oil going to the stock tank and the gas back to the control house.

Automatically Controlled

When the first plants were installed in the Seminole Field, the majority of them were hand-controlled plants and the operating force located in the control house was in direct communication with the performance of all meters showing the amount and pressure of the gas which was being sent out to the various wells on the lease. Each well is ordinarily operated at that pressure which has been determined as the most satisfactory for its output. The necessity of constant vigilance at the control apparatus influenced the opinion that automatic controlling equipment would be a great advantage for operation of this system, and consequently automatic control meters were introduced. The mechanical control in air plants seems to be more popular than the hand-control at this time.

One type of automatic control consists of an orifice meter with a mercury float-type differential recording gauge and a volume control unit. The flow of the gas through the pipe is computed from a recording chart attached to the meter. The volume control valve on the gas line is operated by gas through machinery in the recording instrument. The quantity of gas to be supplied to each well and the pressure may be kept uniform by setting an index pointer on the gauge to a differential pressure which will correspond to the flow of gas desired. If the flow of gas to the well becomes more than the amount which has been predetermined, the control equipment will reduce it and if the gas being delivered to the well drops in volume or pressure below the quantity desired, it will increase it.

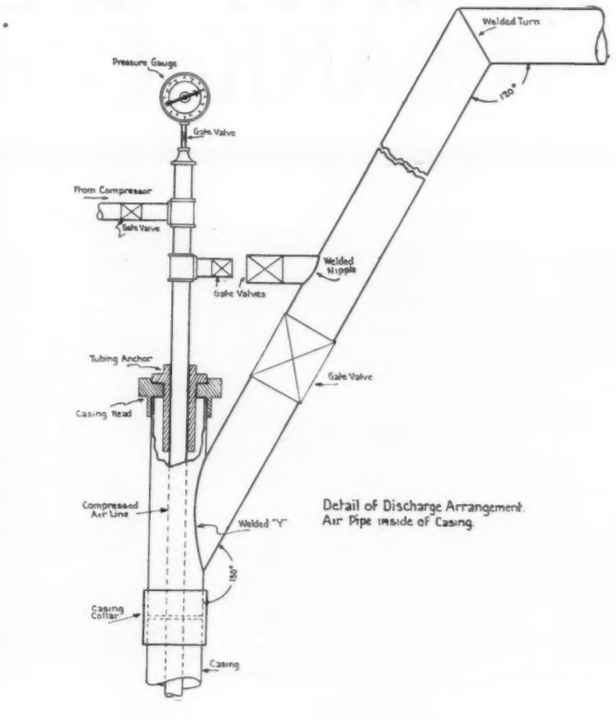
Differential Regulator

Another type of control equipment being introduced is a differential regulator which is employed to keep a steady pressure on the gas going to the well. When the oil standing at the bottom of the hole becomes greater than usual, and the well heads up, the pressure which is present in the well increases due to the oil in the hole being quite a ways above the inlet to the tubing. When this pressure becomes much greater than usual, the differential regulator automatically increases the volume of gas which is delivered to the well and reduced the column standing in the hole. When too much gas is going to the well this mechanism automatically decreases the quantity of gas being delivered.

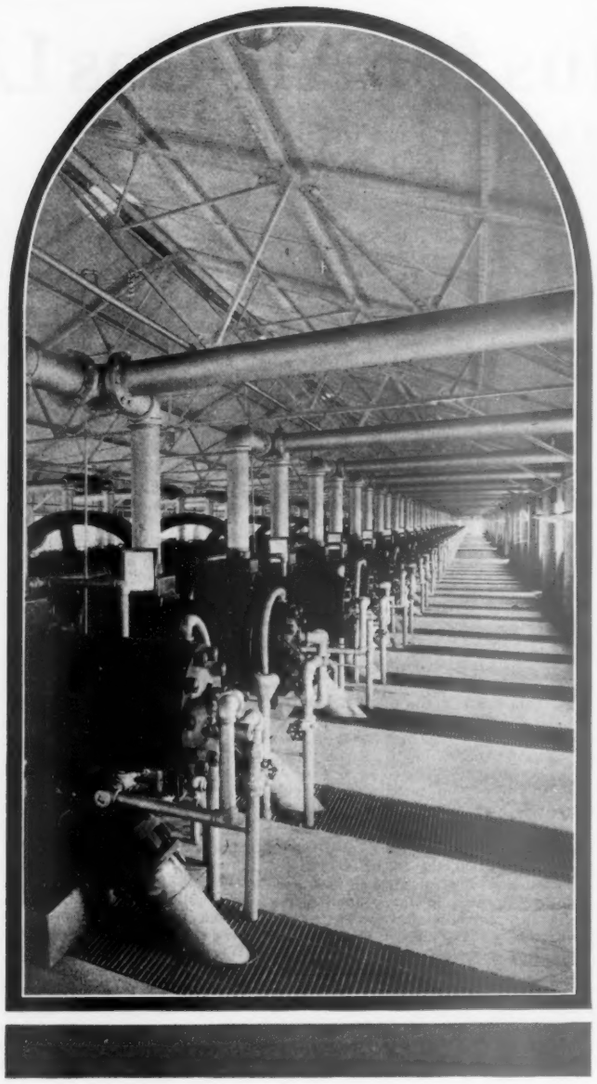
Near the top of the drawing and running with the other header lines a small 3-inch high-pressure kickoff line will be observed. This is the starting line for placing the air or gas into the wells when operations are first begun or after the wells have been shut down for any cause. The common practice in flowing wells of the usual production is to use a working pressure of about 200 pounds. When a well is to be started and has a column of oil standing in the hole it is natural that a much greater pressure is required to institute the flow than the pressure necessary to maintain the flow. This is the function of the kickoff line which is only used in starting the wells.

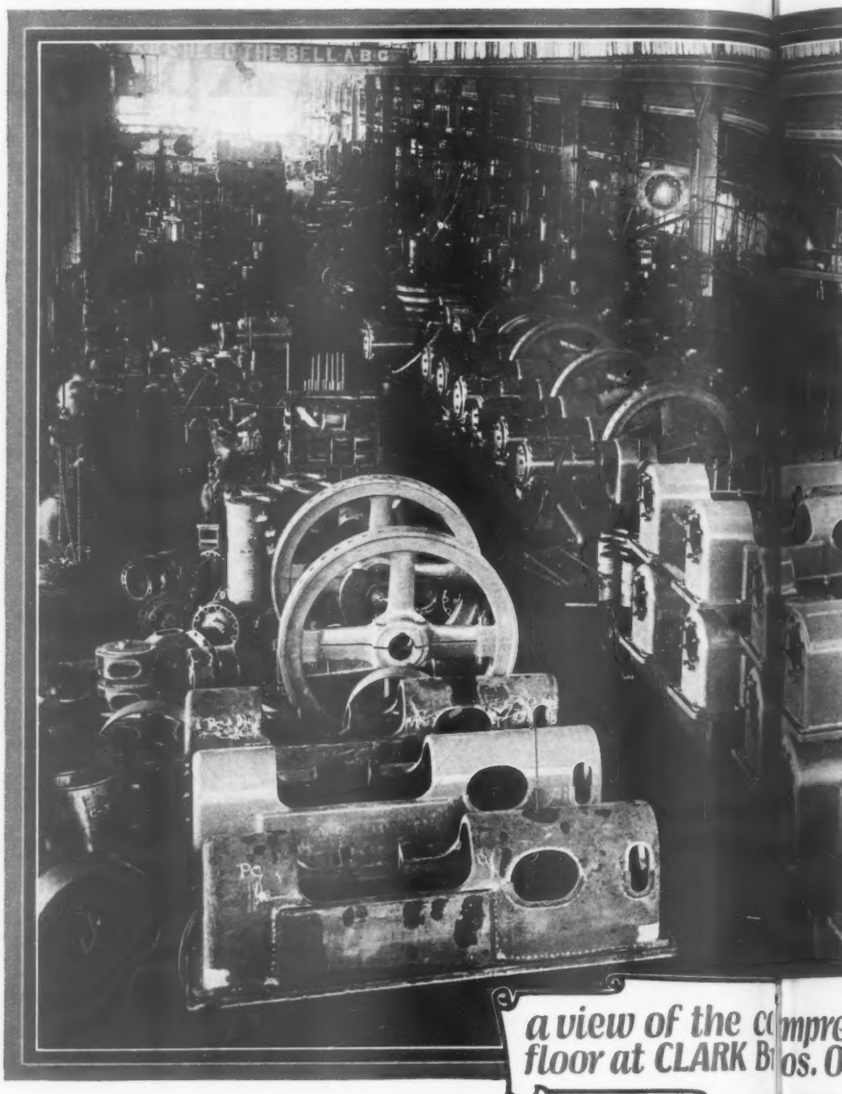
When wells are to be started on air-gas lift, a process known as rocking the wells is often used. The column of oil is subjected to a pressure from below when the air or gas is turned into the hole. After the pressure has been introduced from below, it is then introduced from above, and the top of the column forced down. This performance is repeated several times, and the well is finally rocked off and the flow begins. Rocking the wells has accomplished the purpose of doing away with much of the high pressure which was required to start the flow when ordinary methods were used, and the air or gas was introduced from the bottom of the hole until the well began to flow. It has worked a good advantage in the lift system on account of doing away with some compressor capacity which was formerly required to raise such a heavy pressure for starting operations.

The building which houses the air plant is generally of sheet steel over structural steel frames. As many of these structures are temporary, they are made of the lightest possible material which is easily transported should it be wished to dissemble the plant. The floor in the temporary plants is usually made of chat, although the larger plants which are



Detail of Discharge Arrangement. Air Pipe inside of Casing.

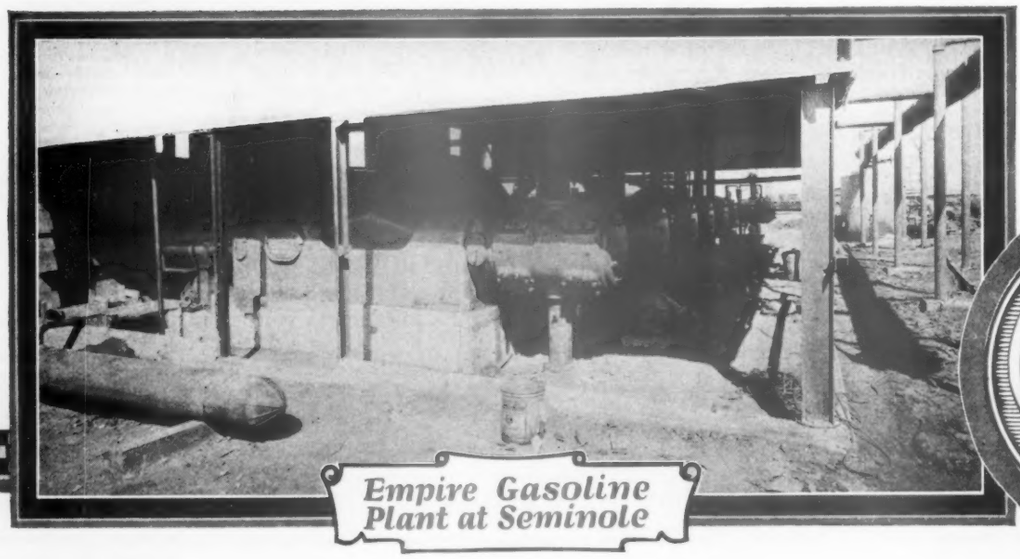




a view of the co mpre
floor at CLARK Br os. O

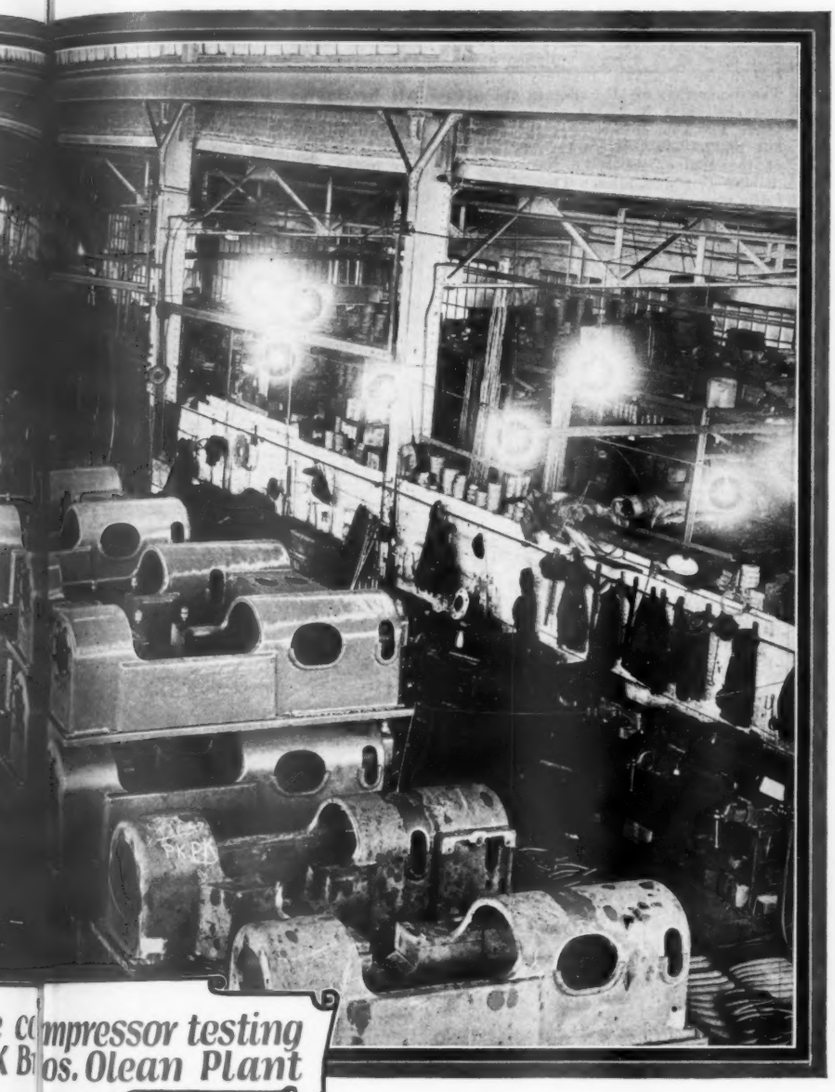
THIS IS WHY WE CAN TR

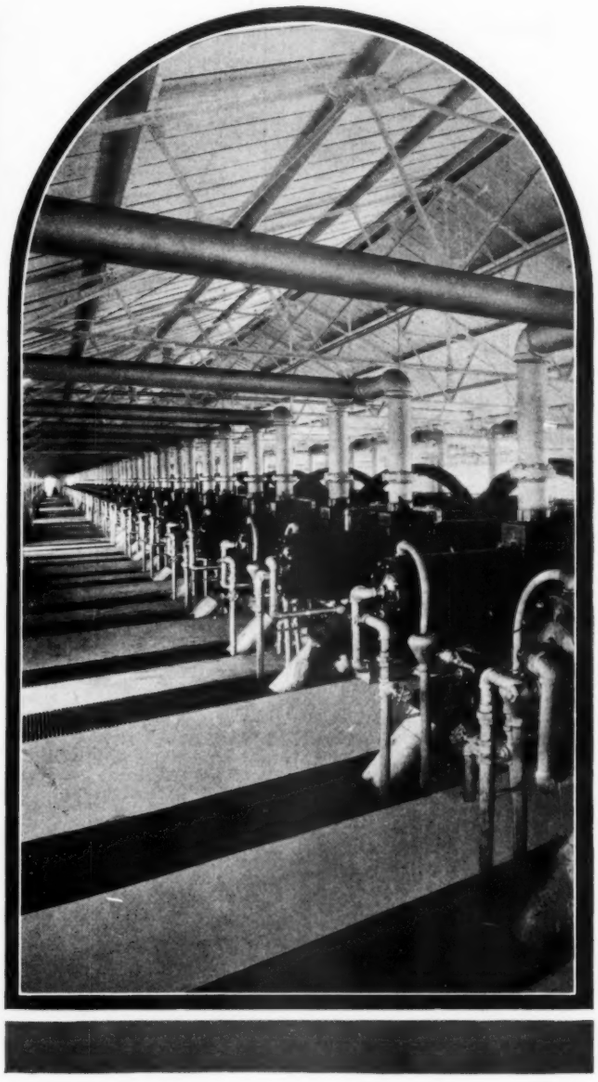
"CLARK Compressors ar



Empire Gasoline
Plant at Seminole

Clark Bro's. Co.
OLEAN
N. Y.





Compressor testing Bros. Olean Plant

TRUTHFULLY SAY:
s are made like fine automobiles"

Most automobile manufacturers maintain "proving grounds" for the purpose of testing stock cars. In this way the manufacturer knows how well his product compares with others; how much service the owner can expect from his car.

Clark Bros. Company also have their proving ground; it is pictured above. But instead of choosing one compressor out of many, as does the automobile manufacturer, for testing, EVERY Clark Compressor is set up and actually put in operation, before the name plate is attached. We know, beyond question, that every Clark Compressor is an engine worthy of the name, BEFORE shipment is made. If a compressor fails to meet the Clark test, it never reaches the field.

Such care in keeping a well earned reputation spotless costs money and takes time; it explains, to some extent, why compressors never "pile up" at the plant. We will not rush production for the sake of supplying a few more compressors above our actual capacity. Every compressor must go through, to the last detail, the production steps that clearly and distinctly mark the Clark Compressor as a better compressor in operation.

See our representatives for compressor and engine requirements from 40 to 200 H.P.

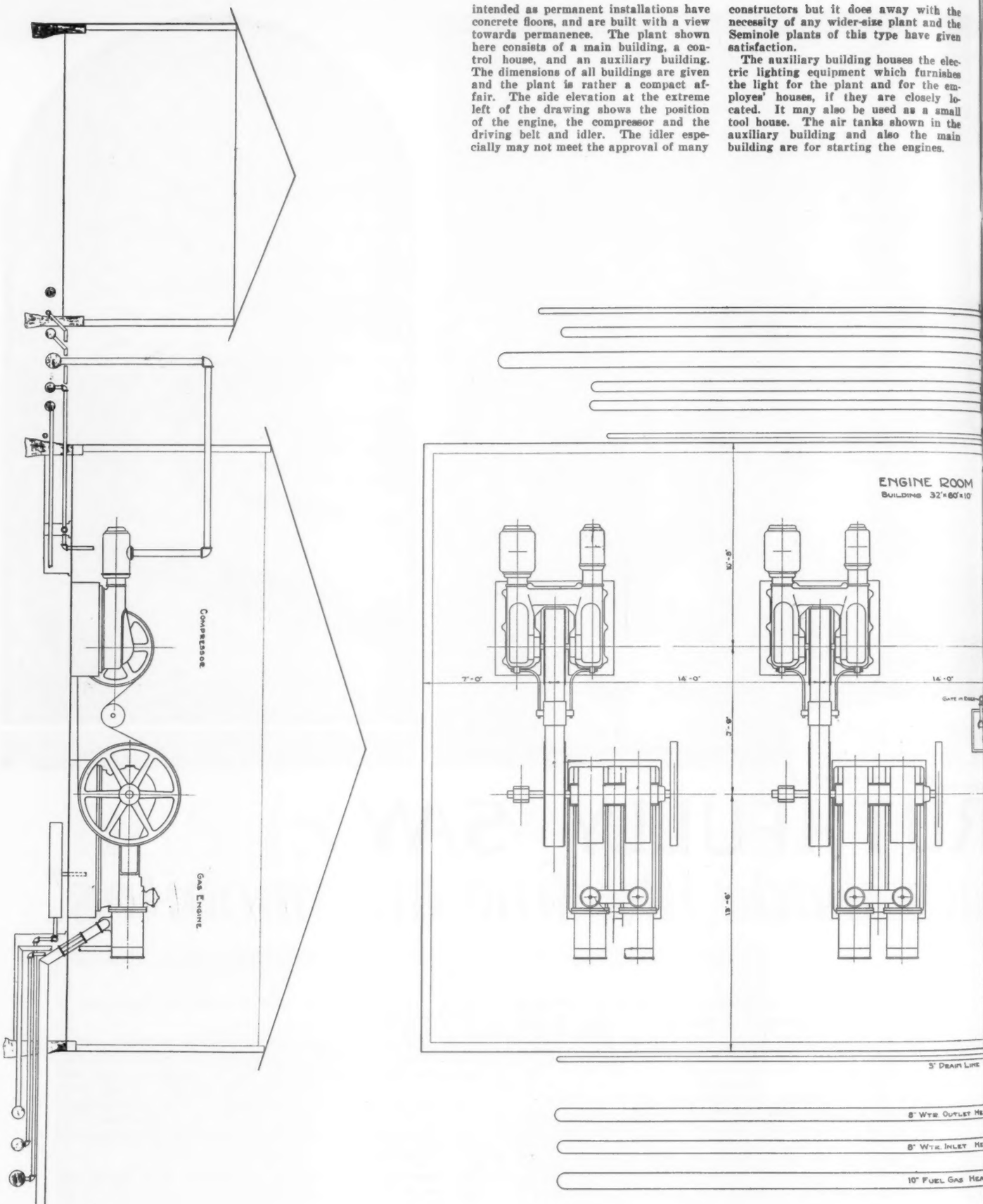
CLARK BROS. COMPANY
OLEAN, NEW YORK

Mid-Continent branch and Warehouse
125 W. First St., Tulsa.
Other warehouses at McCamey and Sweetwater, Texas; and Artesia, New Mexico.

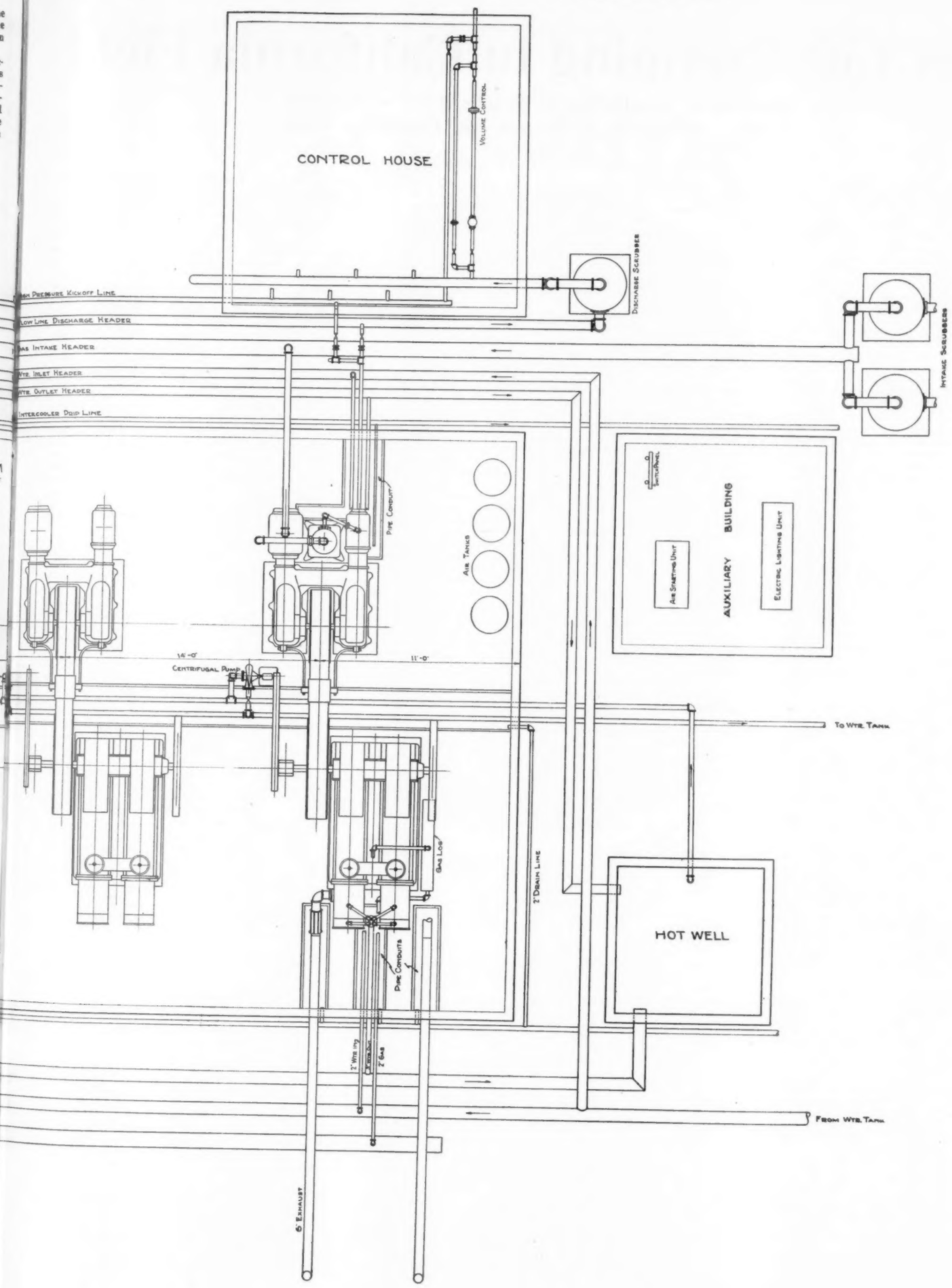
SMITH, BOOTH, USHER COMPANY
228 S. Central Ave., Los Angeles
50 Fremont St., San Francisco

intended as permanent installations have concrete floors, and are built with a view towards permanence. The plant shown here consists of a main building, a control house, and an auxiliary building. The dimensions of all buildings are given and the plant is rather a compact affair. The side elevation at the extreme left of the drawing shows the position of the engine, the compressor and the driving belt and idler. The idler especially may not meet the approval of many constructors but it does away with the necessity of any wider-size plant and the Seminole plants of this type have given satisfaction.

The auxiliary building houses the electric lighting equipment which furnishes the light for the plant and for the employes' houses, if they are closely located. It may also be used as a small tool house. The air tanks shown in the auxiliary building and also the main building are for starting the engines.



Detailed drawing of an air-gas lift plant designed by A. V. B. Candler of Tulsa, Okla. division engineer for the National Supply Co.


CONTROL HOUSE
VOLUME CONTROL
DISCHARGE SCRUBBER
INTAKE SCRUBBERS
HIGH PRESSURE KICKOFF LINE
LOW LINE DISCHARGE HEADER
GAS INTAKE HEADER
WTR. INLET HEADER
WTR. OUTLET HEADER
INTERCOOLER DRIP LINE
SWITCHBOARD
AUXILIARY BUILDING
AIR STARTING UNIT
ELECTRIC LIGHTING UNIT
PIPE CONDUIT
AIR TANKS
14'-0"
CENTRIFUGAL PUMP
11'-0"
TO WTR. TANK
GAS LOG
2" DRAIN LINE
HOT WELL
PIPE CONDUITS
2" WTR. INJ.
2" GAS
6" EXHAUST
FROM WTR. TANK

Gas Lift Pumping in California Field

Mechanical Installations as Practiced in Pacific Coast Fields. Principles of Process and Operating Costs

By H. C. Miller*
Petroleum Engineer, United States Bureau of Mines, San Francisco, Calif.

The gas lift method of flowing oil from wells is the outstanding feature of petroleum technology today. Its forerunner, the air lift, was used successfully first, in the Baku fields of Russia, in 1899, and later in the Gulf Coast fields of Texas and Louisiana and the Kern River Field of California. It is still used to a limited extent in certain oil fields. The use of compressed natural gas for lifting oil from wells has supplanted the air lift method in a measure in those fields where a sufficient quantity of gas accompanies the oil to make the gas lift possible, or where natural gas is plentiful and inexpensive. We find, therefore, in California, that natural gas is used at practically every well where a gaseous medium is employed to flow the oil.

The use of natural gas has many advantages over that of air. It is possible to recover and save the gasoline from the gas that accompanies the oil to the surface. This gasoline would be wasted if air were used as the lifting medium. Also, certain proportions of air and gas form an explosive mixture that cannot be handled safely by compressors. Another advantage that gas has over air is that gas under pressure is more soluble in oil. Gas in solution in oil reduces the viscosity of the oil that is being produced and causes it to flow more readily through the tubing and flow lines.

The gas lift has made it possible to recover many thousands of barrels of oil from deep wells in California that could not have been produced otherwise. It would not have been economical, had it been mechanically possible to produce such wells as the world's deepest producing well (Miley's No. 6 Athens, Rosecranz Field, California) by any other method of pumping known today. At this well, production is obtained from between 7,305 and 7,591 feet and 11 months after completion of the well, production was being maintained on the gas lift at approximately 2,000 bbls. a month.

The crookedness of the hole, or its diameter and depth will not prevent the successful application of gas lift pumping when other conditions are favorable.

During the past two or three years, the oil industry has been awakened to what can be accomplished by the gas lift and though this method has been extensively applied in California and elsewhere, it is far from being a cure-all for all pumping difficulties. Much study and experimenting are necessary before all the mechanical details of the gas lift will be fully understood. Many developments unthought of today will widen the application of the gas lift method of pumping oil from wells.

Principles of the Process

Oil wells equipped for the gas lift method of pumping are customarily tubed in such a manner that the flow of oil to the surface is either through the tubing or through the annular space between the tubing and the well casing. The usual procedure in California is to introduce the compressed gas into the casing at the casinghead. The oil from the well, accompanied by gas from solution in the oil, and free gas from the formation, including extraneous gas pumped in, flows to the surface through the tubing. This mixture of oil and gas from the well flows directly into a gas trap where the gas is separated from the oil. The gas from the trap is conveyed in the intake line to a gasoline plant where, by a series of compressions, and cooling, the gasoline is recovered. In large installations, the wet gas from the wells after being compressed from approximately atmospheric pressure to 25 or 30 pounds per square inch, is passed through an absorption plant and then further compressed to 250 or more pounds pressure depending upon the required working pressure at the well.

The above is a very general outline of the principles of the process of pumping oil from wells by the gas lift method. Many variations of this method are in evidence throughout the oil fields of California. Sometimes portable compressors are used that take the wet gas directly from the gas traps, compress it and recirculate it down the well. The excess gas from such systems is delivered through pop valves into the lease compressor and absorption plant intake lines. Still another method is to treat the gas from the well in a low-pressure absorption plant, then compress it to the required working pressure and circulate it down the well. This method is inefficient because a relatively high back pressure, 25 or more pounds, must be maintained in the gas traps in order to force the gas through the absorbers.

Operating Gas Pressures

Normal working gas pressures vary with the pressure in the oil-producing formation, the gravity (density), viscosity and surface tension of the oil, the back pressure held at the tubing head, and the volume of gas per unit volume of oil lifted. Some foot pieces also have a marked effect on the operating gas pressure. A slight change in any one of these variables is reflected in the pressure necessary to operate the gas lift. It is therefore, not surprising to find adjacent wells operating on widely different gas pressures. Operating pressures vary from 100 to more than 350 pounds per square inch have been noted in one small area where the wells were about the same depth and producing the nearly equal quantities of oil from the same sand. Normal working pressures of 125 to 275 pounds per square inch for lifts of 4,000 feet are common in California. In exceptional cases, however, operating pressures up to 650 pounds per square inch have been noted.

Starting Pressures

Starting pressures are usually from two to five times higher than normal operating pressures. High starting pressures are due to the greater density of the column of unaerated fluid in the well. This fluid offers greater resistance to flow than the mixed column of gas and oil flowing through the eduction tube during normal operation of the gas lift. Because of the high starting pressures often required, compressors capable of furnishing gas at pressures higher than that required for normal operation are usually installed at gas lift wells. When gas is being supplied to a number of wells from a central compressor plant, a booster compressor capable of furnishing gas at pressures of 1,000 or more pounds per square inch is installed.

In order to reduce the required starting pressure as much as possible, so as to avoid excessive high pressures which might injure many wells by forcing the oil back into the formation, provision is made at the casinghead at many wells to reserve the flow of gas down the well. The gas intake line to the well is so arranged that by manipulating certain valves in the gas line, the gas is caused to flow first down the tubing and then down the annular space between the tubing and the casing. Often two or more reversals of direction of the gas flow are necessary to start a well. This method of starting the flow of oil is known as "rocking." The oil can be forced out of the tubing and aerated at a lower pressure than would be required were the direction of flow of gas down the annular space between the tubing and the casing and the attempt made to aerate the oil in the tubing, or to blow it out without first lightening it with gas. This is true because of the difference in cross sectional area of the tubing and the space between the tubing and the casing.

For example, let us suppose that the fluid level in a well stands 500 feet above the bottom of a string of 2½-inch tubing suspended inside of 6¼-inch casing. The total volume of oil within the tubing is 16 cubic feet. The volume of oil outside the tubing is 69 cubic feet. When sufficient pressure is applied at the tubing head to force all the oil out of the tubing, the fluid level outside the tubing is raised 116 feet and the pressure necessary to empty the tubing of oil is 243 pounds per square inch if fractional losses are neglected and oil free of gas pockets and of 24 A.P.I. gravity is assumed. On the other hand, if the source of gas pressure is at the casinghead, the oil in the tubing will rise 2,123 feet and again neglecting friction losses, the pressure required to force all the oil into the tubing will be 1,036 pounds per square inch. It is evident from the above that lower starting pressures are necessary when a well is "rocked" at the start or after a period of idleness.

Gas Volume Required

The volume of extraneous gas required to flow a well by the gas lift method depends upon the rate at which the oil is raised, the size of the eduction tube, the volume of formation gas per unit volume of fluid raised, the position of the eduction tube with respect to the oil zone, and in some cases upon the type of flow device used in the well.

Many wells in California are made to produce oil at a total extraneous gas consumption of only 350 cubic feet per barrel of oil. The average, however, of a large number of wells operating under widely diversified conditions and producing oil from depths of 3,800 to 4,500 feet is somewhere between 1,200 and 1,500 cubic feet of gas pumped in to the barrel of gas produced.

Equipment

Sufficient volume of gas at pressures up to 300 or more pounds per square inch is required for pumping oil wells by the gas lift method. This gas may be obtained from high-pressure gas wells, as is done in several places in California, or taken from a low-pressure source of supply and its pressure raised by means of compressors. No two compressor installations operate under the same conditions because gas volume and pressure requirements differ for each well. Wells that respond to the gas lift method of pumping generally require the maximum volume of gas when first placed on the gas lift or soon thereafter. The working pressures also are usually greatest at the time the well is placed on the gas lift. Moreover, the starting pressures required are often two or more times the working pressures so that individual compressor installations must be designed to meet the maximum gas volume and pressure requirements. For this reason, many compressors now in operation have a much greater capacity than is necessary for efficient operation. Unless the cylinders are frequently changed so as to more nearly satisfy the changed pressure and volume requirements, or the speed at which the compressors are operated is altered, there will necessarily be a waste in operation. Because of this inefficient operation of individual units, large central compressor plants are used for gas lift purposes wherever possible.

1. Portable and Semipermanent Installations.—Many operators use one or more gas-engine, electric-motor, or steam-driven compressor units for bringing in, testing, and pumping individual wells. These units are usually mounted on 4-wheel trucks or on skids and can be readily and easily moved from well to well. Such portable equipment is generally for temporary use only. It is moved to another well as soon as a permanent installation is completed, or the well has been tied into the gas line from a central compressor plant. The compressors of portable units are usually either duplex, or straightline tandem, two-stage machines. Low-pressure gas cylinder diameters range from 8 to 12 inches. High-pressure cylinder diameters range from 4 to 6 inches and the length of strokes from 8 to 12 inches. The majority of portable and semipermanent units in California use 8 by 4 by 8-inch compressors running at a speed of about 250 r.p.m. The size of gas engines and motors for portable units vary according to the power requirements of the compressors. Gas engines rated at 40 to 60 horsepower and electric motors up to 100 horsepower are generally used on portable compressor units. A few semipermanent units are steam driven, straightline machines with 9-inch low-pressure and 4-inch high-pressure gas cylinders, 12-inch steam cylinders and 10-inch stroke.

2. Permanent Installations.—Few large compressor plants have been built in California primarily for furnishing compressed gas for flowing oil wells. On most properties, compressor plants had been built before the advent of the gas lift, to recover gasoline from the casinghead gas and to compress the gas to pressures high enough to buck the line pressures in the commercial gas companies' gas collection systems. This pressure varies usually from 250 to 325 pounds per square inch. These companies furnish gas for domestic and industrial purposes to cities in the Los Angeles Basin, San Joaquin Valley cities and towns and to consumers in Santa Barbara and Ventura Counties.

The problem of furnishing gas to flow wells by the gas lift method on properties where a compressor plant is in operation is therefore a simple matter. The addition of a gas-distributing header with individual lines to the wells, or a gas-distributing system consisting of main lines about the property with individual lines to the wells, the installation of a booster compressor where high starting pressures are necessary, and the installation of gas volume control apparatus at each well where the manually operated central header system is not to be used, constitute the only added facilities required.

Richfield Plant

The Richfield steam-driven compressor plant of the Union Oil Co. of California consists of 19 Chicago pneumatic single-stage, direct-connected, steam-driven compressors. Thirteen of these units are 10 by 10 by 10-inch, five are 10 by 7 by 10-inch, and one is a 10 by 6 by 10-inch compressor for starting or booster purposes; also used in conjunction with the five 7-inch machines when starting pressures are not required. Each compressor is driven by one 80-horsepower Broderick, return tubular boiler.

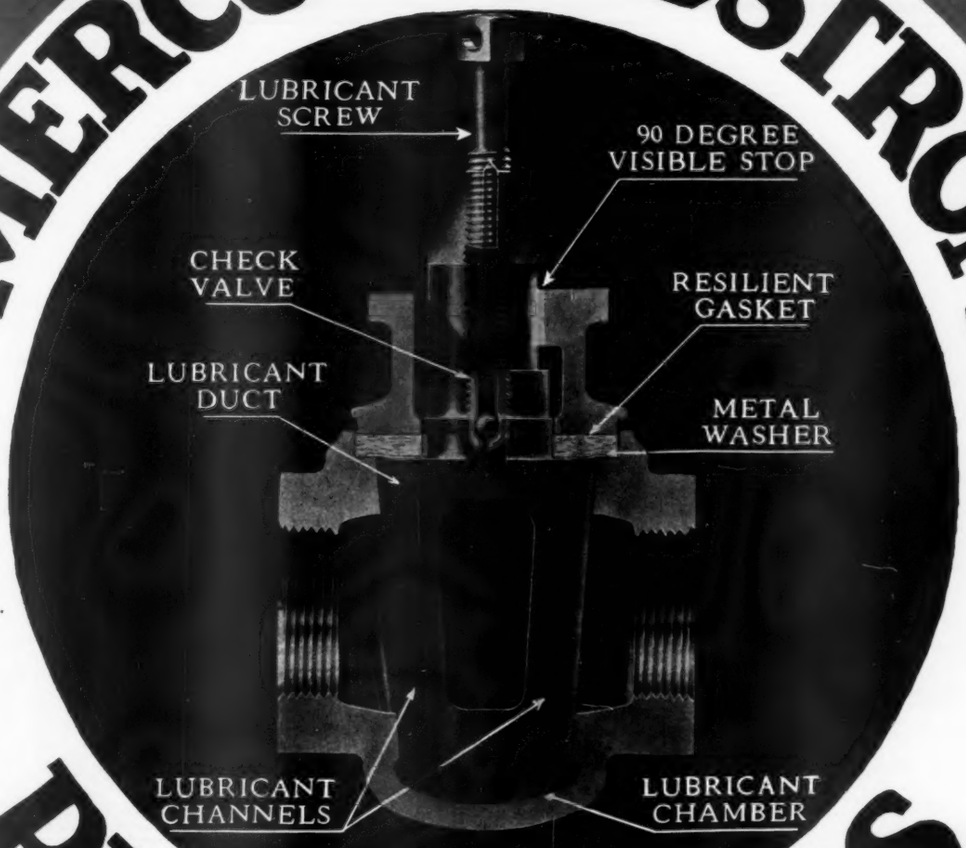
The wet gas from the wells at 10-inch vacuum is first compressed in a separate compressor plant to 30 pounds per square inch and circulated through an absorption plant where its gasoline is recovered. The intake gas to the thirteen 10 by 10 by 10-inch units in the steam-driven plant is taken from the absorp-

*Before midyear meeting, Petroleum Division, A. I. M. E., Fort Worth, Tex. Published by permission of the Director, United States Bureau of Mines. (Copyright, 1927, by the American Institute of Mining and Metallurgical Engineers, Inc.)

Won't Leak

Won't Stick

MERCO NORDSTROM PLUG VALVES



Ask for Catalog

For Petroleum Industry

These valves are particularly essential for the operation of petroleum refineries and supplementary equipment. Successful on high and low pressure lines at various temperatures. Recommended for use on:

AGITATORS:
Acid lines
Air lines
Caustic lines
Oil lines
Steam lines
Water lines

ABSORPTION PLANT:
Gas lines

Gasoline lines
Steam lines

BOILER HOUSE:
Blow-off lines
Steam lines
Water lines

COMPRESSOR PLANT:
Air starters
Gas valves

Gasoline lines
Gasometer valves

FILTER PLANT:
Filter Press valves
Oil lines
Water lines

LOADING RACK:
Fuel Oil lines
Gas Oil lines
Gasoline lines

Kerosene lines
Naphtha lines
Steam lines
Water lines

PUMP HOUSE:
Air lines
Pump house manifold
Steam lines
Water lines

STILLS:
Bleeder valves
Burners
Column line valves
Crude lines
Gas lines
Heat Exchanger lines
Oil lines
Pumping Out lines
Receiving House manifolds
Residuum lines

Run Down lines
Steam lines
Tar lines
Tower valves
Transfer valves

MISCELLANEOUS:
Vapor recovery lines
Tank wagons
Foamite lines
Caustic solutions

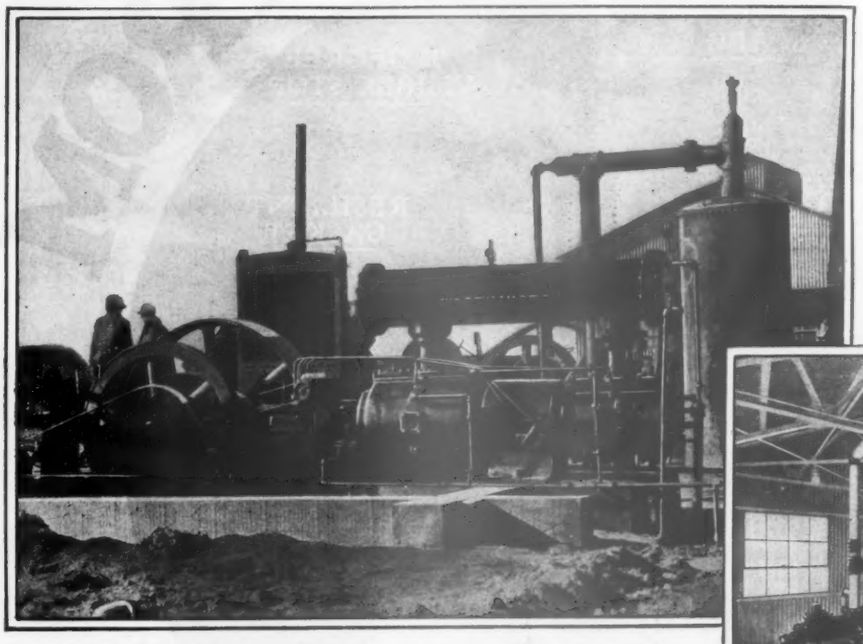
MERCO NORDSTROM VALVE COMPANY
SUBSIDIARY OF THE MERRILL COMPANY

Engineers— MERCO —Manufacturers

San Francisco 121 Second St. | Chicago Peoples Gas Bldg. | Cleveland 325 Engineers Bldg. | New York 11 W. 42nd St. | Houston 1315 Petroleum Bldg. | New Orleans 1501 Masonic Temple Bldg.

AGENCIES IN PRINCIPAL CITIES. FACTORIES AT OAKLAND, CALIF. AND BELLEVILLE, N. J.

WORTHINGTON'S



Two-stage Belt-driven Compressor for air or gas-lift oil-well pumping. Suited for belt-connection to either an electric motor or gas engine.

Worthington Direct-connected Gas-engine Driven Compressor Unit.

The Answer for... Air-Gas Lift Pumping

WORTHINGTON COMPRESSORS for air or gas-lift pumping are the result of a careful study of field requirements.

The belt-driven compressor shown above at the left is adapted to either electric-motor or gas-engine drive—a great advantage when the compressor has to be moved from one field to another. Then, too, the ease with which the compressor can be installed means that little time and money are lost in starting production.

The compressor shown on following page has been designed to fill the need for a compact, semi-portable ma-

WORTHINGTON PUMP AND MACHINERY CORPORATION,

6735-10

ANSWER!..

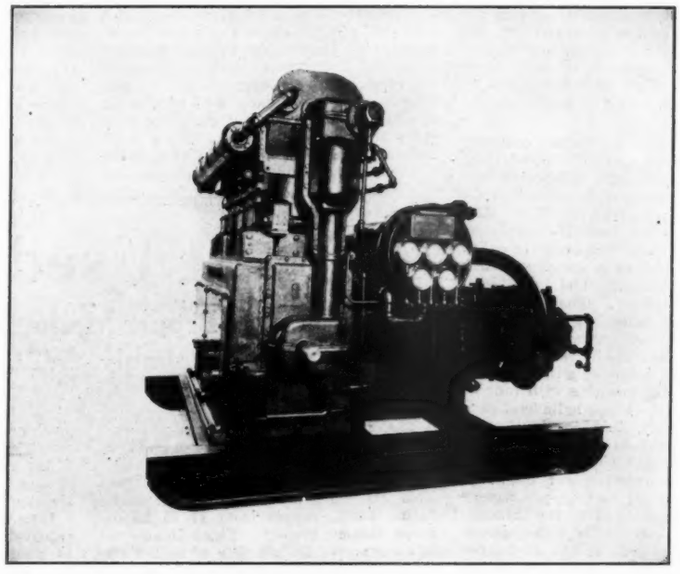
chine. It occupies relatively small floor space, reducing building and foundation costs to a minimum, while its light weight permits easy portability from one field to another. In efficiency it compares favorably with larger permanent units. In short, it is a quality product, designed and produced to fill the need for a real, dependable air or gas-lift compressor.

Where more permanent plants are possible, Worthington is furnishing heavy-duty, horizontal engine-driven units in a large range of sizes. See illustration at right on opposite page.

Worthington engineers will be pleased to furnish complete data on any type of oil-field equipment.

Oil Field Specialists At

Tulsa, Okla	Worthington Machinery Corporation of Okla.
Amarillo, Texas	A. M. Lockett & Company, Ltd.
Borger, Texas	A. M. Lockett & Company, Ltd.
Houston, Texas	A. M. Lockett & Company, Ltd.
Dallas, Texas	A. M. Lockett & Company, Ltd.
San Angelo, Texas	A. M. Lockett & Company, Ltd.
New Orleans, La.	A. M. Lockett & Company, Ltd.
Los Angeles, Cal.	Worthington Company, Incorporated
San Francisco, Cal.	Worthington Company, Incorporated



Worthington Two-stage Compressor direct-connected to Four-cycle Worthington Gas Engine. Unit designed for oil-well pumping.

WORTHINGTON PRODUCTS

CONDENSERS *and* AUXILIARIES

PUMPS FEEDWATER HEATERS

WATER *and* OIL METERS

COMPRESSORS OIL *and* GAS ENGINES

Literature on Request

115 BROADWAY, NEW YORK CITY, BRANCH OFFICES IN 24 CITIES

tion plant discharge line at 20 pounds and compressed to 140 pounds per square inch. The 7-inch and 6-inch compressors then take this gas at 130 pounds pressure and further compress it to a pressure of 325 pounds per square inch. This plant delivers 8,000,000 cubic feet of gas per day at 325 pounds pressure to an 8-inch distributing header equipped with Wescott recording meters and gate valves for controlling the volume of gas to each well. These meters are located at the header on the 3-inch individual lines to the wells. The booster compressor is connected to the distributing header in such a manner that high-pressure gas may be delivered to any one of the 19 or more wells.

The gathering system that brings the wet gas from the gas separators at the wells to the low-pressure compressor and absorption plant consists of main lines 16 inches in diameter with 4-inch and 6-inch diameter individual lines from the well traps.

The new Richfield gas-driven compressor plant of the Union Oil Co. of California consists of four 320-horsepower and one 640-horsepower Worthington direct-connected compressors. The 320-horsepower machines have 16-inch intermediate and 9½-inch high-pressure cylinders; the 640-horsepower compressor has a 22-inch intermediate and a 13-inch high-pressure cylinder. The length of stroke on all machines is 20 inches. The diameter of the gas engine cylinders is 18½ inches. The 320-horsepower compressors are each equipped with two, and the 640-horsepower machine with four of these 18½ by 20-inch gas cylinders, each of which is 4-cycle, double-acting.

As at the Richfield steam plant, the intake gas to the gas-driven plant is taken from the absorption plant discharge at a pressure of 20 pounds per square inch. The discharge from the intermediate cylinders enters the high-pressure cylinders at 80 pounds and is discharged at a pressure of 325 pounds per square inch. The capacity of this plant is 12,000,000 cubic feet of gas per day at 325 pounds pressure.

Santa Barbara Plant

A compressor plant installation for flowing four wells at Cat Canyon, Santa Barbara County, California, consists of two Ingersoll-Rand two-stage compressors with 12 by 12-inch low-pressure and 6 by 12-inch high-pressure cylinders. The compressors are driven by 110-horsepower Bessemer gas engines, size 13½ by 18-inch. The intake gas enters the low-pressure cylinders at atmospheric to 3 pounds per square inch pressure and compressed to approximately 100 pounds. From the low-pressure cylinders the gas passes through a cooling tower where a small amount of gasoline is recovered. The gas is then compressed to about 500 pounds per square inch in the 6 by 12-inch cylinders and delivered to the main distributing line. The individual lines to the wells take off from this distributing line. As each well operates under slightly different volume and pressure, volume regulating control valves are installed on each of the individual lines to the wells. After the gas passes through the control valves it is preheated to about 200 degrees Fahrenheit before it enters the well casing.

Intermittent Flowing Systems

The intermittent or impulse system of flowing a number of wells from a single compressor plant of limited capacity is practiced to some extent in California. This method requires less compressor capacity than is necessary were each well flowing simultaneously. Six wells on a property in the Torrance Field, are being successfully flowed by the intermittent system. Three steam-driven compressors, under governor control, handling gas up to 350 pounds per square inch pressure, furnish enough gas to operate these six wells which produce around 500 bbls. of 19 A.P.I. gravity oil daily.

In the intermittent system, all the gas from the compressors is automatically turned into one well at a time and allowed to discharge into that well for a predetermined length of time. In this way the compressors build up sufficient pressure to flow the well, and after flowing, the gas under pressure passes on to the next well to secure like results. For this reason the compressor speed is regulated by governors. Distribution of gas from one well to another is accomplished by a clocklike contrivance which revolves as a dial, pins being placed at intervals which cause electric contact, which in turn effects the opening of small valves releasing pressure to actuate a trip placed at the manifold on the gas discharge line. As soon as the time limit for a certain well is reached the trip automatically causes a cam shaft to revolve to a portion of a turn and in doing so the projecting cams open a second valve by depressing the valve stem. This automatic time regulation changes the direction of the total flow of gas from one well to another, at previously determined time intervals. In this manner, each well receives the full discharge of the compressors for approximately three-minute periods, or each well of the six receives the full volume of gas about once every 18 or 19 minutes.

Volume and Flow Control of Gas to Wells

The proper control of the volume and pressure of the gas to individual wells on the gas lift is essential. For highest efficiency, these factors should be maintained reasonably constant. At some wells, hand control has proved satisfactory and many operators in California are resorting to this method of maintaining proper pressure and volume of gas to the wells. At many large-scale installations of gas lift flowing methods where the gas to the wells is distributed from a common header, the volume of gas to the individual wells is regulated manually at the header by opening and closing gate valves installed on the individual lines at the header.

Some operators, on the other hand, prefer and use automatic control devices because they believe that mechanical pressure and volume control devices are more reliable and effective and that by their use more oil is produced at a lower cost per barrel. Several types of automatic gas-volume regulating devices are in use in the California oil fields. Two types will be described in this paper, the Foxboro and the Natural Gas Equipment Co.'s controllers.

The Foxboro gas-volume and flow controller consists of an orifice meter with mercury float-type differential recording gauge and a volume control unit. The orifice meter operates on the well-known principle that when an orifice of smaller diameter than the line itself is placed in a pipe line carrying a liquid or gas, a drop in pressure is created between the upstream and downstream base of the orifice plate. This drop in pressure, which is known as the differential pressure is recorded on a 24-hour clock-driven chart. The flow of gas or liquid through the pipe line may be computed from the recorded data on this chart. The volume control valve on lines carrying gas, is gas-operated through control mechanisms in the recording instrument. The rate of gas flow to the well can be automatically controlled and the pressure on the well kept uniform and the volume constant, by setting the index arm on the face of the differential gauge to a differential pressure corresponding to the flow of gas desired. If the flow tends to increase beyond the desired point, the control

(Continued on Page 197)

Air Lift Used in Gulf Coast Area

With Proper Mechanical Installations and Control Practice Probably Will Be of Great Aid to Operators

By L. L. Brundred*

The major portion of the production of the Gulf Coast area, represented by South Texas and South Louisiana, comes from the flanks of well defined salt domes. This oil, containing an excellent lubricating stock, ranges from 17 to 28 degrees Baume gravity. Some lighter oil is encountered but the life of such fields is, in general, an open question. In fact there are few light gravity fields which have proved of much value.

In all of the fields water encroachment, or, more properly, water produced with the oil, is a vital factor. After the first head of high-pressure gas is removed, ever increasing percentages of water appear, and naturally the life of the wells is materially affected thereby.

The sands are, as a rule, extremely fine, very soft, and must be carefully excluded from the hole by the use of fine screen to prevent sanding up. All sands are tipped at such extreme angles as to make coring essential for the location of water strata, oil-bearing sands and important shale beds. Even with modern coring, the correlation of logs is a difficult problem.

Use Air Instead of Gas

Due to the fact that the bulk of the oil is refined for its lubricating properties, little attention has been paid to losses by evaporation in the field. This is largely influenced by the fact that the major companies have set a price schedule, showing but two grades, "A" and "B". The average oil company, therefore, does not attempt to use the gas lift but relies primarily on the air lift and then only on wells considered to be particularly adapted to its use, namely those capable of producing large quantities of fluid and yet not having sufficient "kick" to flow.

Furthermore, as the gas contained in the reservoirs is mostly methane gas, such gas being very quickly vaporized and produced in large quantity in the early life of the fields, there is little gas left after the first flush flowing period of the wells. In fact it is very generally conceded that gas is a very precarious fuel to depend on in any of the coastal fields. This situation largely accounts for the fact that air, as the lifting medium, is almost universally used.

In the average field, wells are drilled on the flanks of the domes in close proximity to each other, largely on account of the extreme dips of the formation and "town lot" leases, and space to set up machinery and other equipment is very restricted. Also, the swampy condition of the average field adds to the difficulty of securing good foundations without extreme expense.

Consideration must also be given to the relatively short life to any one producing horizon. It has often been pointed out that whatever oil is to be obtained from a given horizon must be produced before the expiration of a two-year period, as the increase in percentage of salt water will make production of the well from that particular zone highly unprofitable thereafter. To be sure there are in most of the fields many additional zones to be called upon so that wells are constantly being deepened or worked over to bring back their profitable production.

Quick Installation Necessary

From the above it may be noted that expenditures of large sums for more or less permanent gas-lift equipment have been considered illogical. The average operator therefore considers quickness of installation, portability to a new field and salvage value rather than cheapness of fuel and other costs of operation. The direct result of this attitude is that by far the bulk of all installations has been steam-driven compressors.

Another important factor influencing the use of steam is the necessity for fire protection in such closely drilled fields. For this purpose boilers with steam pressure constantly available must be erected. By the addition of one or more units to the boiler station, steam in sufficient quantities is available both for the compressors and the fire protection.

The coastal area is perhaps the most completely electrified oil field section of the United States, in that high tension power lines form a veritable network of connecting sources of electric power, at a very favorable rate to the consumer. Such rate is surprising in view of the fact that all generating plants are steam driven. The availability of this relatively cheap power accounts for some of the recent installations of compressors belted to electric motors. The cost of operation is, however, hardly comparable with gas or oil engine-driven units.

Practically all compressors installed to date, whether steam, electric, gas, or oil-driven have had displacements ranging from 300 to 500 cubic feet per minute, and little attempt has been made to centralize control in one large distributing plant serving a number of wells simultaneously. In fact it was practically an accepted fact in this area that it was essential to have one compressor to one well. Also little use has been made of the modern volume controllers for carefully apportioning the gas to each well. As a result there are practically none of the so-called "central plants" operating a number of wells either with the loop system or header control house located near the plant.

Installation Methods

On account of the heavy type of oil produced, the large percentage of water present and the failure of the bulk of the oil companies to take advantage of the most modern methods, such as unrestricted flow pipes, traps set close to the derrick floor, and the use of volume controllers, little information as to the exact efficiency being obtained is available. In the few cases where this information is available, the results would seem to indicate that the wells in this area will require slightly higher circulated gas to oil ratios than that necessary in other fields. It must be said, however, that there is an insufficient number of installations where the input and output air is metered to make such a statement entirely conclusive.

Little attention has been paid to the Christmas tree installations in that the bulk of the wells "on air" have used the original Christmas tree hook-up with which the wells were brought in. It followed that considerable difficulty was experienced in attempting to raise or lower tubing quickly as well as to start the wells on gas lift by rocking. The work being largely considered as experimental, few of the operators were willing to incur the expense of special gas-lift Christmas tree layouts.

The use of jets or other flow devices seems to be prevalent. Comparative data on the same well using first a flow device and later open-end tubing are not available and little experimental work of any kind has been conducted to date due primarily to the present low price of oil.

Recent drilling has opened sands at a much greater depth than heretofore encountered and the task of pumping these wells, especially with the high percentage of water present, has become a distinct problem. It is believed that gas lift under proper control and with proper mechanical installations will, after considerable experimental work, prove to be of considerable aid in the solution of these problems. This area offers certain fundamental difficulties, not encountered perhaps in any other district; therefore, by experiment only, can the full value of this modern method of producing oil from deep sands be determined.

*Midyear meeting of Petroleum Division, A. I. M. E., Fort Worth, Tex.

Copyright, 1927, by the American Institute of Mining and Metallurgical Engineers, Inc.

TICO GAS ENGINES

are used by the Sinclair Oil & Gas Co. in the largest Booster Station in the Seminole District —

Past performance of Tico Gas Engines proclaims its present preference in many of the largest gas producers throughout the oil country.

Witness, for example, one of the Tico Gas Engines used by the Sinclair Oil & Gas Company in the largest booster station in the Seminole District. *It was chosen in preference to all other gas engines on true merit alone.*

When you consider that the Tico Gas Engines used by this Company were subjected to the critical comparison of practical oil men, then tested and proved in actual performance to be absolutely dependable, you'll agree that Tico's have something more than a mere claim for gas engine superiority.

See your Continental man for particulars.

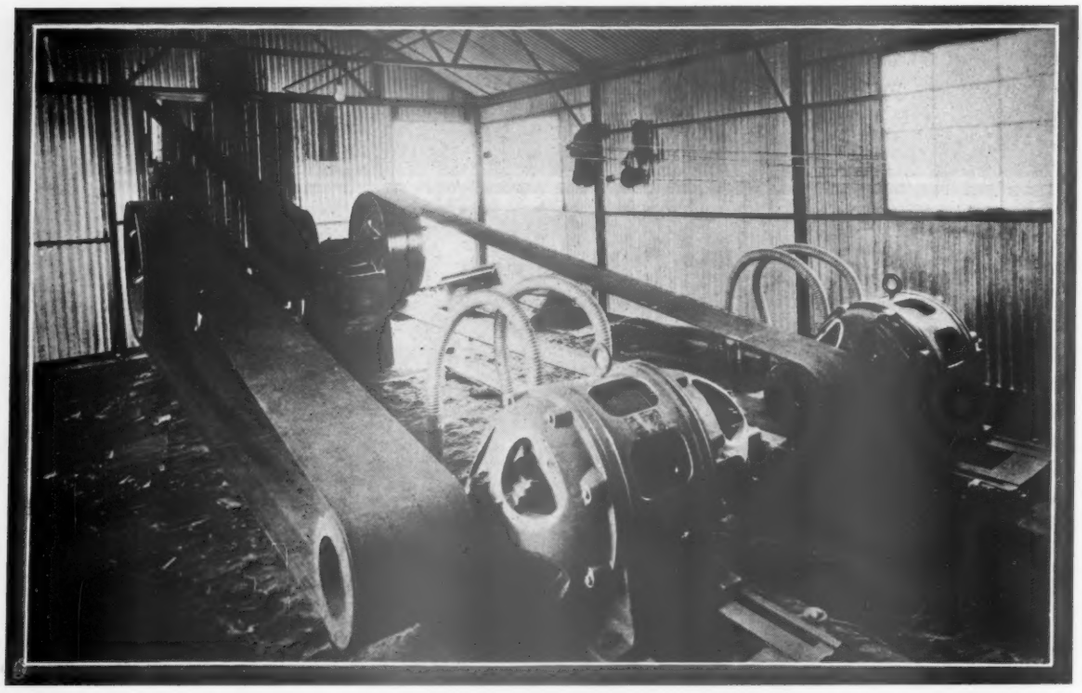
The TITUSVILLE IRON WORKS Co.
TITUSVILLE - PENNA.
SOLE DISTRIBUTORS
The CONTINENTAL SUPPLY COMPANY

Titusville Acme Boilers, Single and Twin Steam Drilling Engines, Tico Gas Engines, Band Wheel and Geared Powers

For THE CONTINENTAL 72-76 Trinity Court

Export WELL SUPPLY CO. New York City, N. Y.

Titusville Acme Rotaries, Acme Swivels and Speed Draw Works, High Pressure Boilers, Crown Blocks, Slush Pumps



A Safe Bet for Operators

IT'S natural for oil men to take a chance. Taking a "flyer" on a lease and gambling on hitting a gusher or duster is part of their game.

Operators, however, cannot trust to chance in selecting drilling equipment. This, they know, must have all the dependable elements for steady performance, for low upkeep and length of service.

Westinghouse twin motor drilling equipment meets all the strenuous requirements of oil fields, and, besides, has many economical advantages not found in other forms of power.

Wells can be drilled quickly and at less cost. There is a constant, steady flow of power twenty-four hours a day—every day. Perfect motion is assured at all depths of the holes. Starting, stopping, reversing and close speed adjustment can be instantly controlled from the derrick floor.

This equipment requires little attention and installation is so simple that the services of an electrician are not required.

Service *in the* Oil Fields

Westinghouse service for oil fields extends wherever operations have started. Whether it's equipment for drilling, pumping, air or gas lifts, rig lighting—any phase of oil field activity where electricity is used—Westinghouse is prepared to serve with undivided responsibility.

There is a Westinghouse office near every field that will gladly cooperate and offer friendly, helpful, engineering advice in solving your problems.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

X94940 A

Compressor's Success in Old Fields

Repressuring the Bartlesville Sand in Nowata-Rogers Area in Oklahoma Has Had Good Results. Methods Vary

By James McIntyre

It has been a long way from the invention of the air pump by Otto von Guericke of Magdeburg, Germany, about 1654, to the giant air compressors of the present; also a long way from Holl's use of an air engine to raise water in England in 1753 to the use of air compressors to lift oil in the Corsicana Field in Texas about 30 years ago.

The oil industry had made use of the air lift in raising water for drilling purposes in Washington County, Pennsylvania, years before it made use of it for the purpose of lifting oil, but it demonstrated its value as a producing adjunct in the Corsicana and later the Gulf Coast Fields long before it applied the practice in producing oil in California or the upper Mid-Continent.

The air lift was in use in the oil industry many years before I. L. Dunn, in 1911, thought of using a compressor for the purpose of restoring the pressure in oil sands by forcing gas into and through the sand in wells on a lease in the Marietta Field in Ohio.

The use of gas instead of air in lifting oil is an improvement of very recent times.

Now the use of large and expensive gas or air-lift plants in flush fields and of large repressuring plants in very old fields where the gas pressure is light or entirely gone, are approved practices.

Both the lifting and the repressuring methods, whether with air or gas, may be put down as successful, although not universally so.

Next we may expect to see the combination of both systems in semiflush fields and a continuous and complete recycling of gas as long as there is any gas available. The Seminole Field in Oklahoma may be the first to be treated in this manner. It is a part of the Seminole program of development.

Success in Repressuring

If an oil man is looking for a field in which to study the effect of repressuring with compressed air or gas, no better can be found than the Bradford, Pa., Field, if he is an Eastern operator, or the Nowata-Rogers Field in northeastern Oklahoma if he is a Mid-Continent oil man. The Associated Producers (Tide Water Oil Co.) and the Petroleum Reclamation Co., operating in the Bradford Field, are in a position to aid or advise anyone interested in the subject, while in the Nowata-Rogers Field the Tidal Oil Co., Wiser Oil Co., Sinclair Oil & Gas Co., and others which have had two or more years of experience with repressuring have some interesting data of their experiences both good and otherwise. Like the Bradford water drive and the air-gas lift, repressuring does not always give profitable results. Where it does work out there is no complaint as to the quantity of increased production it forces through the sand and into wells. There are many instances of from 50 to 500 per cent increases in production and as a rule the oil produced under the pressure methods is a little higher gravity than before pressure was applied.

So much has been written of repressuring that it seems unnecessary to even outline it here, but for the benefit of any reader not familiar with this method of increasing production in old fields it may be said that it consists simply of forcing air or natural gas into the sands through an intake or key well, the air or gas acting as a pressure agent to remove the oil from the sand into near-by oil wells, which are pumped in the usual manner. Some repressuring installations are small, others very large and costly, with many intake wells and a correspondingly greater number of oil wells. In an old closely drilled field like the Nowata-Rogers district in Oklahoma 1 pressure well to 10 oil wells is a fair proportion on a large property. To give the system the greatest opportunity of success in fields of many owners co-operation between producers, as in the "trading" of intake wells, or in buying or selling air (or gas), is quite necessary. Up to this time no field has been entirely subjected to this process. There are yet skeptics and there are also operators who hope to profit by a neighbor's installation without any expense to themselves.

The repressuring method is in use in Pennsylvania, Ohio, West Virginia, Illinois, North Texas, Oklahoma and Kansas, always in old fields where the gas is almost exhausted, and where wells have fallen off to a fraction of a barrel per day. Prompted by the belief that only 15 to 25 per cent of the oil can be removed from the sands by nature itself, the oil man seeks to recover a part at least of the remaining 75 to 85 per cent. A core recently taken in Nowata County, is said to have indicated a per acre content of 5,000 bbls. left in the sand which has been producing over 20 years.

Wiser Oil Co.'s Success

This article will be mainly devoted to the experience of the Wiser Oil Co., one of the oldest oil companies in the Oklahoma Field. E. A. Durham of Sistersville, W. Va., is president of the company. H. Guy Ellis of Bartlesville, Okla., is the manager of the company's Mid-Continent operations, which extend also to Kansas and Texas. Fellow oil men say of Mr. Ellis that he can squeeze more oil out of an old well than most men, but there came a time when even his ability as a handler of old production reached its limit on some wells and he turned to repressuring to extract as much as possible of what was left.

The Wiser Oil Co. may be said to have had signal success with its air-gas installations. It is operating 11 repressuring plants in Nowata, Rogers, Osage, Washington and Creek Counties in Oklahoma, and Chautauqua and Montgomery Counties in Kansas. Four of the plants were installed too recently to have had results. On the properties affected by the remaining seven plants the company has seen its production increase from 280 bbls. per day to 832 bbls., an average increase of about 197 per cent. The increases vary from 15 per cent to 389 per cent. The accompanying table will give the reader a comprehensive story of the company's experience with repressuring.

One Freak Producer

Somewhere between 20 and 22 years ago a certain well was drilled in Section 29-25-17, Nowata County. For the past 90 days that well has been producing 25 bbls. a day. A little more than eight months ago it was producing one-quarter of a barrel per day. Repressuring is the cause of this well yielding 100 times as much oil as it did less than a year ago. It is the Wiser Oil Co.'s No. 8 Hohman Purchase.

But this well is a freak. Repressuring has had no such effect on other wells in that territory, but some notable increases in production have come as a result of the installation of air or gas. The Wiser Oil Co., Tidal Oil Co., Sinclair Oil & Gas Co., Delaware Consolidated Oil Co., George Woodard, Phillips & Milam and Harmon and others, are among those which have profited with increased production by the use of compressed air but there are so many oil wells in the old Bartlesville sand shallow district, 8 899 in Nowata County and 4,299 wells in Rogers County, that the total number of wells included in the repressuring activities forms only a small part of the whole. The Wiser Oil Co. is the largest user of compressed air in the Nowata-Rogers Field. It has put the air to 150 intake wells which is forcing the compressed air to 1,210 oil wells and on October 1 of this year it was showing increases of from 77 to 389 per cent in production in less than two years.

Not Always Successful

The experience of the Wiser Oil Co. is characteristic of the success of repressuring in the Nowata-Rogers fields, wherever the sand conditions were favorable and the equipment properly installed. The use of compressed air has not worked out advantageously in all parts of the field. Although it is all Bartlesville sand territory there are parts of the field where the sand is comparatively soft and where it takes the air easily while in others the sand appears to be almost impenetrable even under prohibitively high pressure of air and there has been no increase in production of oil as a result of its application or no sign of the air in the oil wells. Air installations meet with different conditions which require their own peculiar handling.

The Banner Repressuring Plant

The prize installation of the Wiser Oil Co. is in the Alluwe district. Its compressor station is located in the SE, Section 31-25-17, about 7 miles east of Nowata. This plant is equipped with three low and three high-pressure type 8 Bessemer compressors of 50 horsepower each; one 16 by 8 by 16 Ingersoll-Rand compressor, driven by a 165-horsepower Foos engine; two 12 by 6 by 12 Ingersoll-Rand's, driven by one 80-horsepower Bessemer engine, and one 80-horsepower Foos engine; one 165-horsepower, 15 by 8 by 20 Bessemer Type 10 direct-driven compressor and one vacuum pump driven by a 165-horsepower Foos engine to bring the gas to the plant. Both air and natural gas are used but are not sent into the same wells. Part of the above installation is in the gasoline plant from which about 350,000 cubic feet of gas daily is introduced into a part of the pressure or intake wells. Altogether about 1,000,000 cubic feet of air and gas per day is used. There are 568 oil wells in the group affected by this Alluwe plant.

Pressure was first applied in December, 1925, when the wells were producing 122 bbls. per day or a shade less than one-fifth barrel per well per day, for the 635 wells on the property. Sixty-seven of the wells were made pressure wells. The following month the wells began to show an increase which gained steadily and by the following March, or three months after the pressure was exerted the production had increased about 100 per cent. Now, after 21 months, the production has increased to 428 bbls. a day, 250 per cent over its natural production. This gives the 568 oil wells an average production of .74 bbl. per day. It is one of this group of wells that is producing 25 bbls. per day or about 34

WISER OIL CO.'S REPRESSURING PLANTS IN OKLAHOMA AND KANSAS

Plant Name and Location—	County and State—	Cost of Plant	Air Wells	Oil Wells	Name of Sand	Date Started on Air	Present Pressure in Lbs. per Sq. Inch	Air Input Cu. Ft.	Daily Prod'n at Start Bbls.	Daily Production Oct. 1, 1927 Bbls.	Per Cent Increase
Alluwe, SE 31-25-17	Nowata, Oklahoma	$ 27,432	67	568	Bartlesville	December, 1925	125	1,000,000	122	428	250
Simpson, SE 19-24-17	Rogers, Oklahoma	3,783	10	59	Bartlesville	June, 1926	250	150,000	9	16	77
Mehlin, SW 20-25-17	Nowata, Oklahoma	13,247	28	288	Bartlesville	December, 1925	180	1,000,000	61	205	389
Hammett, NE 19-25-17	Nowata, Oklahoma	19,924	22	175	Bartlesville	December, 1925	240	500,000	37	93	151
Milam, SW 12-25-16	Nowata, Oklahoma	15,227	23	120	Bartlesville	May, 1925	250	400,000	22	45	104
Amity, SW 21-26-15	Nowata, Oklahoma	750	2	37	Bartlesville	Not completed	...	.....	5	5	...
Dewey, NW 27-27-13	Washington, Oklahoma	4,000	3	70	Bartlesville	August, 1927	200	.....	39	39	...
Osage, SE 21-27-12	Osage, Oklahoma	11,146	10	72	Wayside	February, 1927	260	250,000	28	43	53
Brooks, NW 22-34-13	Chautauqua, Kansas	3,281	5	25	Wayside	July, 1926	125	50,000	1½	2	30
Milander, NE 23-34-14	Montgomery, Kansas	8,000	3	74	Wayside	Not completed	...	.....	20	20	...
Sapulpa, NE 6-16-11	Creek, Oklahoma	2,000	3	17	Glenn	July, 1927	250	.....	7	7	...
	Total	$108,790	176	1,505					351½	903	157

The types and sizes of the various plants above listed are as follows:

Alluwe plant—One 165-horsepower Bessemer direc.-driven compressor, 15 by 8 by 20; one Ingersoll-Rand 12 by 6 by 12 compressor, driven by 80-horsepower Bessemer engine. In addition to the compressors named which are on air, about 350,000 cubic feet of residue gas from the company's casinghead gasoline plant is introduced into a part of the pressure wells in this group at plant pressure. Total present input of gas and air, 1,000,000 cubic fee. per day.

Simpson plant—One Ingersoll-Rand, 5½ by 3 by 10½ compressor, driven by 65-horsepower Foos gas engine, present air input 150,000 cubic feet per day.

Mehlin plant—One 165-horsepower direct-driven Bessemer compressor, 15 by 8 by 20, present air input 1,000,000 cubic feet per day.

Hammett plant—One 165-horsepower direc.-driven Bessemer compressor, 15 by 8 by 20, present air input 500,000 cubic feet per day.

Milam plant—One 165-horsepower direct-driven Bessemer compressor, 15 by 8 by 20, present input of air 400,000 cubic feet per day.

Amity Purchase plant—One 6 by 3¼ by 6 Bessemer compressor, driven by 20-horsepower Foos gas engine, plant not yet in operation.

Dewey plant—One Ingersoll-Rand 12 by 6 by 12 compressor, driven by 65-horsepower Foos gas engine, plant recently started.

Osage plant—One 80-horsepower Bessemer direct-driven compressor, 10½ by 5¾ by 20, present air input 250,000 cubic feet per day.

Brooks plant—One 60-horsepower Reeves vertical direct-driven compressor, present input of air 50,000 cubic fee. per day.

Melander plant—One Ingersoll Rand 12 by 6 by 12 compressor driven by 100-horsepower Snow Diesel oil engine, plant not yet operating.

Sapulpa plant—One Ingersoll Rand 8¼ by 4¼ by 10 compressor, driven by 30-horsepower Foos engine, plant recently started.

There's only

KEROTEST

Carried in stock and sold by

Grinnell Co. of the Pacific, Los Angeles, San Francisco

Norwell-Wilder Hardware Co., Houston, Beaumont, Shreveport, Fort Worth

Oil Well Supply Co., Oklahoma, Kansas, Colorado, Wyoming

Export Distributors

Oil Well Supply Co., Pittsburgh, New York, Tampico, London.

There's only one valve manufacturer that subjects every valve to the severe kerosene test and that's

KEROTEST

There's only one drilling valve that's tested 24 hours in a testing laboratory under pressure of 3000 pounds and that's

KEROTEST

There's only one valve that's certified by an independent inspection organization before being shipped to the oil fields and that's

KEROTEST

There's only one drilling valve that enjoys a world-wide reputation for strength and unfailing performance and that's

KEROTEST

Take no chance on untried valves — *specify KEROTEST.*

KEROTEST MANUFACTURING CO.
PITTSBURGH, PENNA.

KEROTEST

REGISTERED U.S. PAT. OFF.

times as much as the average well in the group.

The Mehlin plant, in Section 20-25-17, Nowata County, is not connected to as many wells as the Alluwe plant, but it has produced a greater percentage of oil increase. With 28 air wells and 288 oil wells the property has increased to 205 bbls. a day from 61 bbls., an increase of 389 per cent in less than two years.

The Bartlesville sand in that part of the county in which the Alluwe and Mehlin plants are situated lies at about 400 feet in depth and has a thickness of about 20 feet.

Other Successful Operators

George E. Woodard, of Nowata, one of the leading individual producers in the Nowata-Rogers Field, has experienced at least three notable production increases on the leases to which he has "put the air" in Nowata County. In June, 1927, he applied compressed air to two intake wells on a lease of 11 wells which had been producing 3.81 bbls. per day. In two months the nine oil wells produced an average of 20.22 bbls. per day. Another lease of eight wells which had produced 4.78 bbls. per day produced 13.49 bbls. per day from seven oil wells, one having been made an intake well. Another lease of five wells which made 1 bbl. a day was increased to 6.42 bbls. per day when air was applied. Mr. Woodard has air plants on other leases, however, where the increase was small and one property which has not been affected at all even under very high pressure. The air is going through, but he does not know where, as none of his neighbors have been benefited by it.

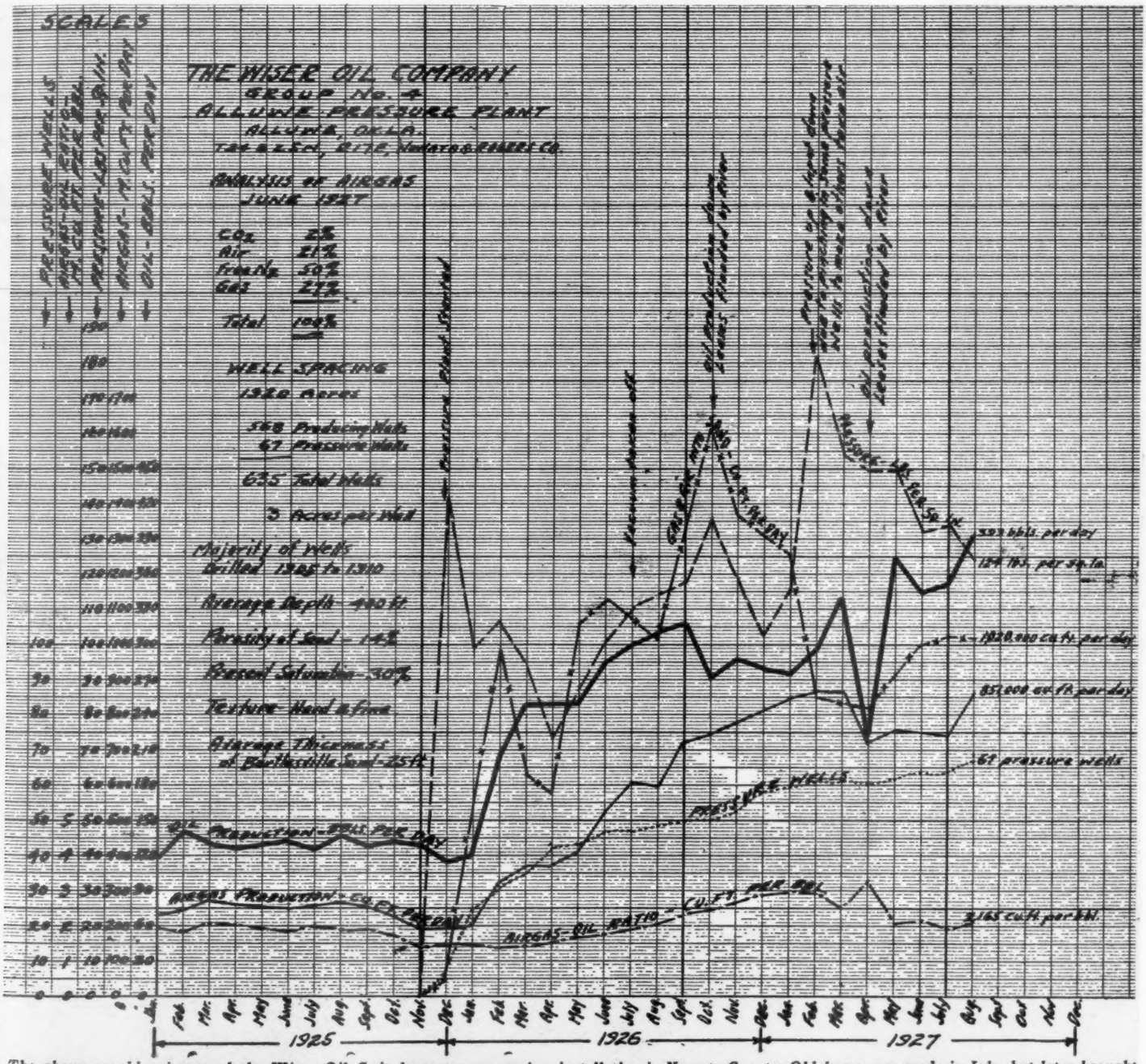
The Sinclair Oil & Gas Co.'s Bratcher lease, in Section 25 21-17, one of the earliest of the air leases in the Nowata district, increased from 20 bbls. a day to more than 80 bbls. a day, but it has declined to about 49 bbls. a day. The pressure was started over two years ago.

Harmon and others are reported to have had signal success in most of their repressuring operations, and much has already been written about the success of the Tidal Oil Co., which was among the pioneers in applying pressure and which had remarkably good results with it in the Lenapah district, in the northern part of the county.

Making Wells Flow

The Delaware Consolidated Oil Co., which is made up of a number of companies and firms that own leases in the Nowata Field and that pooled them for the purpose of more economical and efficient operation under the repressuring system, has six compression plants, equipped with a like number of 220-horsepower Miller direct-driven compressor operating at present between 450 and 500 oil wells in the Delaware Pool (Township 25-17) where the Bartlesville sand lies at about 1,200 feet in depth. I. L. Dunn of the Dunn-Lewis Oil Recovery Co., who is in active charge of this big property, while claiming it had proved successful in increasing the production of the properties affected, would not give figures showing total percentage increase. Mr. Dunn's ambition is to see the whole property put on a flowing basis. Most of the wells are yet on the pump, but a considerable number of them have been equipped so that they will flow twice a week. One well in particular flows twice a week under a 130-pound back pressure. It was good for one-half barrel a day before the pressure was applied. Now it yields 20 bbls. a week through a small orifice, which is below its actual producing capacity. The Delaware Consolidated Oil Co. uses both air and gas in its repressuring operations. It has had a greatly increased gas recovery which it makes use of in its repressuring. Mr. Dunn believes that eventually every well in the field will have to be recased, and as he considers that the life of the Nowata-Rogers Field has been increased no less than 15 years by repressuring the expense of providing new pipe for the thousand of old wells in that territory will be justified. Also he believes it will be necessary in the successful development of the big field under repressuring. Should Mr. Dunn's belief be borne out it would mean that about 9,000,000 feet of new casing would have to be run in the Nowata-Rogers Field. At 50 cents per foot this would mean an investment of about $4,500,000 feet in pipe. Such a quantity of pipe strung out into a pipe

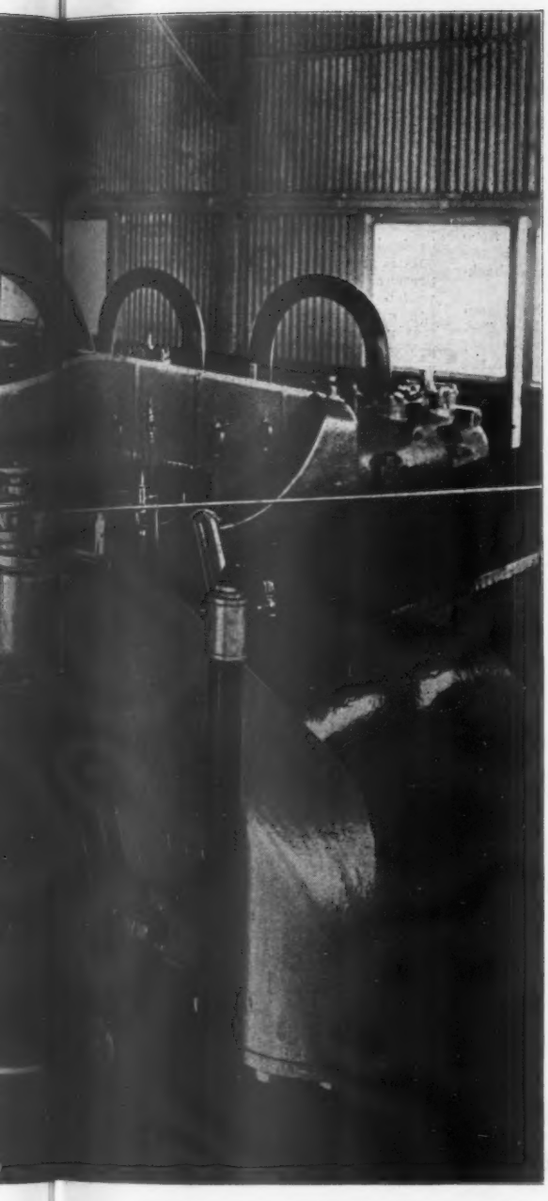
(Continued on Page 129)



The above graphic picture of the Wiser Oil Co.'s largest repressuring installation in Nowata County, Oklahoma, was made in July, but later brought up to August 31, when the oil production stood at 393 bbls. On October 1 the production had mounted to 428 bbls. with no changes in the installation or in the number of wells producing. There is no reason to believe that the peak of the increase has been reached. This property has shown a 250 per cent increase in production in less than two years.

COOPER

ENGINES



Why Would Marland Choose Coopers?

The photograph shows Marland Oil Company's Seal Beach California gas lift plant. A similar plant installed at about the same time contains five Cooper Type-80-170 B.H.P. Cooper Gas Engines.

No one can be sure whether it was fuel economy, simplicity of operation, low lubricating oil consumption, Cooper field service or general accessibility of the engines which influenced Marland Oil officials to install these first Cooper stations. More than likely it was the general satisfactory reports from so many users, covering all of these important factors, which led to their choice of "Coopers." It is a fact that more companies have swung to Coopers this year than ever before.

THE C. & G. COOPER COMPANY
MT. VERNON, OHIO

604 Kennedy Building, Tulsa, Oklahoma.
1111 Magnolia Building, Dallas, Texas.
1218 Bank of Italy Building, Los Angeles, California.

Back Pressure and Ultimate Recovery

Gas Lift Properly Applied Will Increase Ultimate Production. If Not Properly Handled Will Decrease It

By E. O. Bennett*
Chief Production Engineer, Marland Co. of Texas.

When oil is taken from a subsurface structure it is generally accompanied by gas. The gas thus produced represents those lighter hydrocarbons present in the original petroleum accumulation but which are insoluble at the reduced pressures created around a well when it is producing. In some cases the gas accompanying the oil may come from a gas-bearing stratum not in immediate contact with the oil. The amount of gas from the formation accompanying each barrel of oil is called the natural gas factor.

Energy Causing Well to Flow

The force causing the flow of fluid into a well when it is drilled into an oil-bearing structure is the pressure differential between the well bore and the formation. A pressure differential between the formation and the well may be set up in three different ways as follows: (1) Pressure due to gas in solution or in contact with the oil; (2) hydrostatic pressure due to water in contact with the oil (it may be either bottom or edge water); (3) pressure difference due to force of gravity.

The greatest source of energy for producing oil from most oil fields, and the one over which the greatest control can be exerted, is the potential energy in the gas under pressure in the formation. In any pool there is but a definite amount of gas available. Part of this gas may be in solution and a part in contact with oil. The amount of gas in solution in each barrel of oil depends on the pressure and temperature in the formation and the characteristics of the oil. Whether the gas is in solution or in contact with the oil it is necessary to use the energy it contains as efficiently as possible in order to obtain the greatest ultimate recovery from the pool.

Bush[1] states:

"Gas being the most efficient aid in moving the oil, it is important to prevent more of it from escaping than is necessary to remove the maximum amount of oil from the sands. The conservation of this energy is far more important to the producer of oil than his returns from sales of gas to distributing companies. The flowing life of the well is the most profitable period, and keeping the gas-oil ratio low, or keeping the gas in solution as long as possible, prolongs the flowing life of the well and moves more oil from distant parts of the sand, thereby increasing the total ultimate recovery of a property or field. Laboratory experiments have proved that the viscosity of oil is greatly reduced with gas in solution, and when this gas is under several hundred pounds pressure, the viscosity of the oil tested was said to be about the same as that of gasoline. When the gas escapes the viscosity increases, and oil is left in the sand to be recovered only by expensive methods and at a very slow rate."

The amount of energy required to produce a barrel of oil from a well depends on several factors. Some of these factors are controllable and some are not. The controllable factors are: (1) Rate of production; (2) pressure on the formation. The uncontrollable factors are: (1) Porosity of formation; (2) permeability; (3) viscosity of oil; (4) surface tension of oil.

The factor having the greatest effect on the rate and ultimate production of a well is the pressure held upon the producing formation. The rate at which the energy is dissipated is governed by the flow differential. This, in turn, is controllable over certain limits by back-pressure regulation. Millikan[2] states:

"So high a pressure differential between the sand and the well may exist that the gas will move through the sand at a greater velocity than that at which it will carry the maximum amount of oil. As the pressure declines, the velocity of the gas is reduced and a smaller volume carries with it an equal or greater amount of oil, which results in a declining gas-oil ratio. Under these conditions if the velocity of the gas is reduced by increasing the pressure the amount of oil would be increased and the volume of gas per barrel of oil decreased. Excessive velocity of gas through the sand is affected by the size of the pores in the sand as well as the pressure differential, larger pores permitting an excessive velocity under conditions which would be normal in a finer grained sand."

Condition of Well Under Back-Pressure

The gas lift has been given much study and discussion during the past year. It has been used primarily as a means of increasing the output of wells; and but little thought has been given to the efficiency of well flow with regards to ultimate recovery. Most gas or air-lift installations have been put in with the view of getting maximum production and maximum mechanical efficiency in the flow line. But little regard has been given to that part of the well below the flow line. When compared to the efficiency of the well the mechanical efficiency of the flow line is of secondary importance. To strive for mechanical efficiency in the flow line only will generally cause an economic loss in production.

It is true that with a high mechanical efficiency in the flow line a small amount of gas is required to raise a barrel of oil than when low efficiency exists. If the amount of gas coming from the formation is ignored, the total production efficiency of the well may be very low even with the very best mechanical efficiency in the flow line. The result of this condition is that while a fair rate of production may exist the well's ultimate recovery will be decreased. Efficient operators equip their wells with meters and gauges on the input side. There are, however, very few who measure the discharge gas from the well. The difference between the output and the input gas is the amount taken from the formation. It is called the natural gas factor. The natural gas factor is the best criterion of the well's condition and should be given the most consideration at all times. A careful study of natural gas factor decline will give very valuable information regarding the ultimate recovery of a well.

Effect of Pressure

The principle involved in applying the gas or air lift to producing an oil well is not new, nor is its application in the oil industry new. Some of its most important features are, however, given but very little consideration. The gas lift may be called a mechanical means of controlling pressure on the producing formation. Under this condition the title of this paper might better be "Back-pressure and Its Effect on Gas Factors and Ultimate Recovery." Before discussing the use of the gas lift and its relation to ultimate recovery, it is advisable to discuss the effect of pressure on the condition of the sand in the well during different stages of the life of the well.

As to the condition of the producing formation around the well when the well is first drilled in, approximately all of the gas is completely saturated. This is also evidenced by the fact that wells flow, where the pressure is suitable, as soon as the bit penetrates the formation. If a well is drilled in and allowed to produce unchecked a maximum differential is created between the formation and the well. This sudden release in pressure allows the gas contained in the oil to escape. Much of the escaping gas gets away without doing any work in moving oil to the bore of the well. The only work it can do then is to assist the oil through the tubing or casing. Such energy can better be supplied from the surface. The oil drainage area into the well is: $D \pi \times A$, where D is the diameter of the well bore and A is the penetration into the producing formation.

Then

$$Q = \frac{AP \times D \times \pi \times A}{R^a} \text{ where}$$

Q = the quantity of oil producing during a definite period of time.

AP = the difference in pressure between the formation and the well. (It is the rock or shut-in pressure minus the back-pressure on the formation.)

R^a = the resistance factor which governs the flow through a sand. It is governed by the porosity and permeability of the formation, the characteristics of the oil, and rate of flow.

When First Drilled

When a well is first drilled in AP and A are both large and R^a is small. This indicates that, on account of the saturated condition at the well, the oil produced has but a short distance to travel and the production rate will be high. With a maximum saturation, maximum drainage area and low resistance, but little work is required to move oil into the well. The result is that the well fills rapidly and imposes a pressure on the formation, on account of the hydrostatic head created. This pressure then decreases the differential or flowing pressure AP and keeps the gas dissolved in the oil from escaping at a maximum rate. As long as the flow rate from the well does not exceed the rate of influx into the well, the saturation next to the well will be great and the escape of free gas small. It is for this reason that oil is always produced with lowest gas factors at the flush stage of production.

As production is continued for a period of time the oil must travel farther to get to the well. The resistance to travel from a distance increases very rapidly and the energy required increases in a corresponding amount. This requires more gas per barrel since the pressure and energy contained in each cubic foot of gas also decreases. If the oil is continually removed at a rate approximating the flush stage, it is produced faster than it can enter the well. The result is that the space around the well is drained of oil and allows gas to escape very readily.

The upper portion of the formation near the well has been denuded of its oil and a large drained area is left through which gas can escape without moving any oil. The total drainage area for the oil to enter the hole now becomes $D \pi \times A1$ and since A1 is much less than A there is less opening for oil to flow into the well. These conditions can exist where the well is still in its early life, but has been produced at too great a rate. It may also exist during the later life of the well when natural depletion has occurred. The quantity Q as before is $= AP1 \times D \times \pi \times A1$. In this case AP1 is large and A1 is small. The product of these two may now be greater than it was in the first case. This would indicate a greater production rate. On account of the increased area for gas bypassing and the increased resistance to the flow of oil on account of the smaller drainage area and greater distance the oil must travel the production actually becomes less and the gas factor increases.

After a well has produced for a short time and the existing pressures are such that it will continue to flow naturally, the amount of gas escaping into the well, which does but little work in moving oil to the bore, is greater than the amount required to aerate the fluid column in the casing to the point where the pressures are unbalanced and the well flows. The result is that the oil is produced with a very high natural gas factor, a low producing efficiency, and the ultimate recovery from the well is decreased.

Resaturation

Petroleum as found in a completely saturated formation is a hydrocarbon fluid composed of liquid and gases. When this condition has been reached and back-pressure is applied to the well the gas, being highly compressible, is affected at a greater rate than the oil. Any increase in back-pressure, or decrease in differential pressure, causes a greater static pressure to exist in the formation at the well bore. This increased pressure which can approach the rock, or shut-in formation pressure, as a maximum, compresses the gas adjacent to the well into a smaller space than it formerly occupied. The same pressure which compresses the gas has but little effect on the volume occupied by the oil, as the oil has characteristics more like a pure liquid.

By holding the gas to a smaller volume, the oil occupies more of the space formerly occupied by the oil and the formation becomes resaturated. The resaturation has taken place under a declining flow differential, yet the production will be maintained and sometimes increased. The principal advantage gained is that of reducing the volume of gas produced per barrel of oil with assurance of a greater ultimate yield and lower production costs.

High back pressures are conducive to steady flow and minimize clean-out costs. High rates of flow cause sanding up of wells, and the closing of the porosity near the well by fine sand and sediment carried along by the oil.

The Gas Lift

The gas lift provides an excellent means of holding back pressures on a formation. The pressure on the formation is governed by two factors. One is the oil head, H, between the bottom of the tubing and the top of the pay. The other is the working pressure of the input gas. H is governed by the position of the tubing above the formation. The working pressure is governed by the size and length of the flow and the relative amounts of oil and gas flowing.

When a well is equipped with a gas lift during the time it will still flow naturally the total pressure on the formation should be maintained at as high a point as possible. Small tubing for the flow line can be used to accomplish this or larger tubing with a choke or "bean" at the surface. Holding back pressure on gas-lift wells is not generally practiced, but good results may be obtained by so doing.

The gas lift provides a means of increasing the flow rate of most wells where applied and is generally installed for this purpose. Such practice, however, will not generally give the maximum ultimate recovery.

A well declined under flowing conditions during the first three months of its life. At the end of three months the well was placed on production by the gas lift. After two months on the gas lift the well was placed on the gas lift under pressure control at the surface and from that time on for the next several months the decline practically stopped.

(Continued on Page 139)

*Before midyear meeting of the Petroleum Division, A. I. M. E. Copyright, 1927, American Institute of Mining and Metallurgical Engineers, Inc.

[1] R. D. Bush: Conservation of Gas in the Production of Oil. Publication of California State Mining Bureau (March, 1927) 12, 9

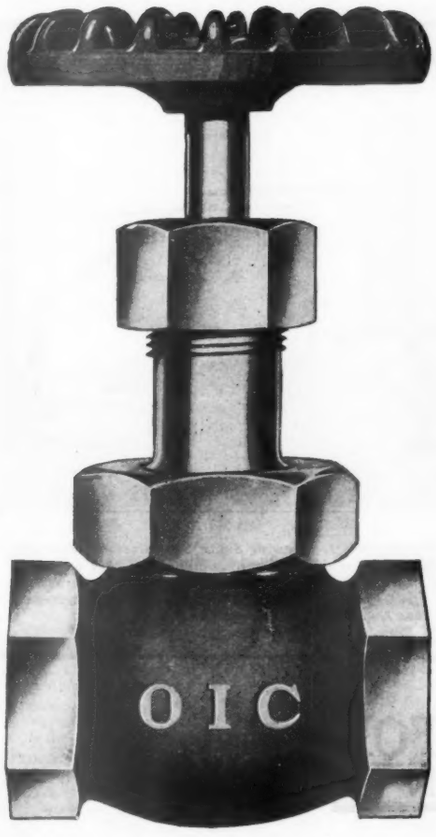
[2] C. V. Millikan: Gas-Oil Ratio as Related to Oil Production Decline, Petroleum Development and Technology in 1926 147.

There's Extra Value in *every* OIC VALVE

STURDILY built, with an excess of metal and refinements of design that increase both strength and operating ease, the entire line of O. I. C. Valves delivers a long life of trouble-free service in the face of abuse.

The high factor of safety and ready adaptability to a wide range of operating conditions make these "tough" valves a sound investment for high steam and air pressures, or other places where it is difficult to keep ordinary valves tight.

Take the No. 370 Extra Heavy Bronze Union Bonnet Valve illustrated here for example. The special bronze of its body, bonnet and union nut retains its tensile strength to a remarkable degree under widely varying operating conditions. A more liberal union connection eliminates a common weakness at this point. The spindle is gland packed and equipped with ventilated, non-heating hand wheel.

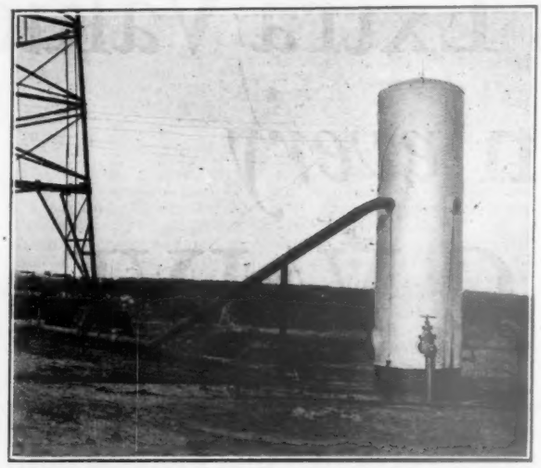


We build a complete line of exceptionally serviceable valves for steam, oil, water and gas in all sizes from 2 to 16 inches. Complete information will gladly be furnished by our authorized distributors or from headquarters here at Wadsworth.

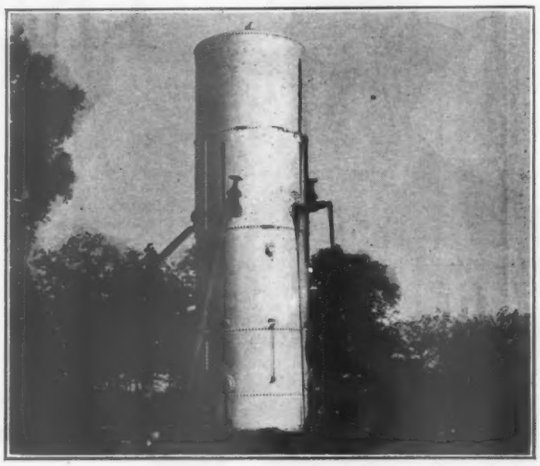
OIC

THE OHIO INJECTOR COMPANY
WADSWORTH, OHIO

O. I. C. Valves are Carried in Stock and Distributed in the Mid-Continental Field by the International Supply Company, Tulsa, Oklahoma and Branches.



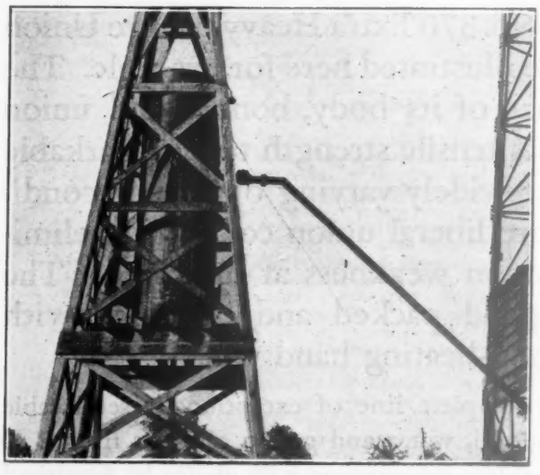
Amerada Petroleum Company, Roscoe No. 4, Seminole Field. Showing Smith Separator with casing head and flow-line connections.



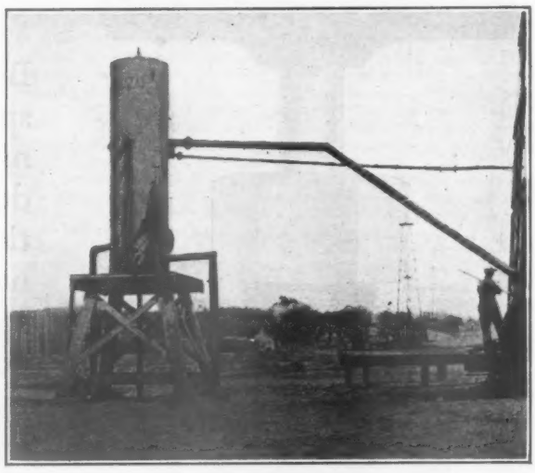
Prairie Oil and Gas Company, Harbor Lease. Showing the Smith Separator with flow-line connections both from casing and tubing of several wells.

EVIDENCE of SMITH SEPARATORS

Successively Handling *Air and Gas Lift Wells*



Tidal Osage Oil Company, Harjocke No. 4, Seminole. Showing a Smith Separator with flow-line connections. The Separator is elevated with the oil gravitating from the Separator to the stock tanks. This Smith Separator has been in constant service since Powel Field days. It has been moved some 20 times at little or no expense, and is still in good serviceable condition.



I.T.I.O. Bowlegs No. 1. Showing Smith Separator with flow line from casing and also connection from tubing, so that well may be flowed either through casing or tubing. The Separator on this lease is elevated so that the oil gravitates from Separator to stock tanks, eliminating back pressure.

SMITH SEPARATOR COMPANY

Tulsa Okla.

NEW YORK OFFICE:
Export Representative:
Oil Field Equipment Co.,
30 Church St.
Cable Address:
"Oilfields," New York

CALIFORNIA OFFICE:
2039 East 38th St.,
Los Angeles, Calif.

LOUISIANA OFFICE:
405 Forest Ave.,
Shreveport, La.

LONDON OFFICE:
Perkins MacIntosh Petroleum Tool & Boring Co., Ltd.,
25 Bishopsgate
Cable Address:
"Oleborers," London

TEXAS OFFICES:
924 Post Dispatch Bldg.,
Houston, Texas
1402 Fort Worth Natl. Bank Bldg.,
Fort Worth, Texas

PRINCIPLES OF AIR-GAS LIFT PRACTICE

(Continued from Page 42)

putation of total friction is an involved problem. This acceleration is graphically shown in Figure 1, in which the relative velocity is shown by the distance between the water slugs. The problem of friction is thus to keep down velocity.

Analyses of air-lift data by graphic and other means indicate that while friction increases with velocity, the slippage decreases with velocity, thus where slippage predominates, friction tends to be the minor quantity and vice versa, so that when we reduce one the other increases and our final problem is in keeping these two factors balanced so that their combined loss is a minimum. The fundamental laws governing the volume of a gas at different pressures, and the work available in gas due to its state, are very simple, but the methods of directing these laws, or, rather, the arrangement of our equipment so that we may benefit most, is our complicated problem. These problems are:

(A) 1. The complicated laws governing the variation of friction of flowing gases and fluids. Although similar, the friction of flowing water or oil, and gases, are not identical.

2. By the fact that the law governing the flow of either, changes at some critical velocity.

3. By the fact that the relative quantity of gas and oil or water, or all three are variable in any flowing column; that is, the relation of quantity of gas and oil or gas, oil and water in the rising column varies from top to bottom of the eductor tube.

4. The change of the friction laws of the flowing constituents at some specific velocity.

5. The variation of volume and pressure of the gas, or pistoning, or lightening medium of the column.

(B) The fact that slippage varies with nature of gas and fluid to be lifted, and with the changes in the quantity relation of gas and fluid, and with the state of the gas.

(C) Due to the fact that oil wells are not drilled and cased especially for gas-lifts, and the rock pressures or submergences are not chosen for efficiency alone, but chiefly to allow the greatest quantity of oil to come into the well. Therefore, and as a consequence, producing oil by gas-lifth is not merely a gas-lift problem, but is inseparable and really a minor part of the oil production problem, and as a consequence becomes more complicated and involved, due to the limits imposed upon its operation.

As a summation of (A), (B) and (C), we wish to say that the gas-lift in its simplest form has never been thoroughly analyzed or reduced to mathematical calculation. Therefore, we do not have hopes for a complete or definite mathematic analysis of all its adaptations to oil production, but we do believe that by the study of all the obtainable factors in any one pool or well, oil can be produced in some instances more efficiently and cheaper by the air-lift method than by other methods, but we also believe that many of the claims for gas-lift are a little rosy, and that in many cases more efficiency could be had by a careful analysis at regular periods on the various wells on a lease. Although, as we have pointed out before, we do not believe any fixed mathematical analysis can be devised whereby all conditions can be reduced to a common denominator, we do believe that with the combination of experience in various fields on which an intelligent, consistent analysis has been made, much can be done to eliminate the mistakes so common in the application of air-lift to oil production in new or untried wells or pools.

Collecting and Analyzing Evidence

In examining a well in a pool on which the gas- lift has not been tried or experience factors set up, the data necessary to determine whether a gas-lift would be beneficial are:

(A) General.

1. Depth of sand.

2. Nature of sand or producing formation.

3. If the well flows or had ever flowed naturally, and how long. (See Specific.)

4. Size of drill hole and how cased.

5. Whether oil was produced by gas or water drive, or the relation of each as near as possible, if both water and gas were the energy expelling the oil.

6. The initial production and relative rate of decline of oil, gas and water, if any.

7. Present rate of production as compared to other wells in pool similarly located and drilled.

(B) Specific Information.

1. If the well were flowing:

(a) Rock pressure of shut-in well.

(b) Nature of flow; that is, steady or by heads, etc.

(c) Quantity of oil, gas and water, if any, produced by well against different back pressures held on the head of the well, three tests of this nature are desirable, and the data worked up in the forms hereinafter described.

2. If the well is not flowing:

The quantity of oil and gas that the sand will deliver should be plotted against the head in feet of fluid above the top of the sand; that is, the oil level should be pumped, swabbed, or bailed down to three or more depths, and the quantity of oil and gas produced from these various places tabulated and plotted against pressure head of fluid above the sand, which pressure may be deduced from head and density of column, taking account of gas quantity in the column, gravities of gas and liquids, etc.

The following data on two wells illustrates the authors' methods of working up for comparison the data gathered on flowing wells. From the examination of the data so tabulated, and compared with experience factors and certain fundamental curves prepared to fit in with the experience factors and data, deductions can be made, indicating the present efficiency relation to a deduced possible efficiency of flow under improved methods and conditions.

The gain of such changes as are necessary then may be balanced against the expense and time lost in changes.

METHOD OF WORKING UP DATA FOR PURPOSES OF COMPARISON

		Well 1	Well 2
1.	Barrels oil per day	2,860	200
2.	Barrels of water per day	.....	.....
3.	Total fluid per day (barrels)	2,860	200
4.	Total fluid per second (cubic feet)	0.1861	0.0130
5.	Gas furnished per day	480,000	650,000
6.	Natural gas per day	1,305,000	185,000
7.	Total gas per day	1,785,000	835,000
8.	Total gas per second (cubic feet)	20.68	9.67
9.	Total gas-oil ratio (cubic feet per barrel)	624	4,175
10.	Furnished gas-oil ratio (cubic feet per barrel)	168	3,250
11.	Natural gas-oil ratio (cubic feet per barrel)	456	925
12.	Weight total liquid per second (pounds)	9.55	0.68
13.	Weight total liquid per second (pounds)	1.55	0.72
14.	Total weight lifted per second (pounds)	11.10	1.40
15.	Depth of tubing	4,216	4,108
16.	Submergence in feet	1,340	264
17.	Lift in feet	2,876	3,844
18.	Velocity at top in feet/seconds 1/2	114.0	41.4
19.	Velocity at bottom in feet/seconds 1/1	8.44	7.42
20.	Difference in velocity (V_2-V_1)	105.56	33.98
21.	P_1 (abs.)	499.4	126.4
22.	P_1 corrected (abs.) bottom well	493.0	109.7
23.	P_2 corrected (abs.) bottom well	28.4	19.4
24.	$R_1 \frac{P_1}{P_2}$	34.23	7.62
25.	$R_2 \frac{P_1}{P_2}$	17.36	5.66
26.	Total work in gas through R_1 foot pounds/seconds	151,500	40,700
27.	Total work in gas through R_2 foot pounds/seconds	121,750	34,780
28.	Total work lifting liquid + gas + acc. foot pounds/seconds	33,834	5,407
29.	Total work lifting liquid foot pounds/seconds	27,450	2,614
30.	Total work lifting gas foot pounds/seconds	4,460	2,768
31.	Total work lifting acc. liquid + gas foot pounds/seconds.	1,924	25
32.	Total work unaccounted for foot pounds/seconds	87,916	29,373
33.	E_1 Work lifting liquid, per cent = Work in gas through R_2	22.60	7.53
34.	E_2 Work lifting gas, per cent = Work in gas through R_2	3.67	7.97
35.	E_3 Work of acceleration, per cent = Work in gas through R_2	1.58	.07
36.	E_4 Work lifting liquid + gas + acc., per cent = Work in gas through R_2	27.85	15.57
37.	Unaccounted for work, per cent = Work in gas through R_2	72.15	84.43

Pressure and Volume of Air

Extensive experiments with the air-lift in raising water has disclosed that for each depth, size of pipe, and quantity of fluid to be lifted there is a certain pressure and volume which will give the greatest efficiency of lift. If the pressure is exceeded, less air volume will be used, but the total horsepower will be increased and similarly, if a lesser pressure is used, more air is needed, and the total horsepower consumed is greater. The results of these experiments disclose a curve of the nature shown in Figure 4, which is taken from a paper by Davis[1] and Weidner. The submergence corresponds to relative pressure.

The percentage of submergence or the relative pressure to the height of the lift is greatest in the shallow wells and becomes less and less with increasing depth of the well, though the maximum efficiency obtainable likewise becomes very much less with deep wells. Thus in Figure 4, for wells of increasing depths there would be a series of similar curves of less output or efficiency, and with the point of maximum efficiency shifting to the left, thus showing decreased submergence or relative pressure.

In the oil fields the pressure and volume used will result not only from the considerations of the maximum efficiency obtainable but also from consideration of the ends desired and the practical limitations; for example, if it is desired to get the maximum daily production, efficiency would be given little weight and all efforts would be directed toward increasing the rapidity of flow to the point where increasing friction placed a limit on the capacities of the eduction pipe. In another case it might be desired to hold a considerable back pressure on the well which might exceed the pressure of maximum efficiency, and in still other cases the declining rock pressure will necessitate the use of flowing pressures much below the air pressure of maximum efficiency. In fact, in each well the use of the air-lift goes through a series of changes often starting above the pressure of maximum efficiency and finally ending at a pressure so far below the most efficient that an air-lift becomes unusable as a continuous process.

Depth of the well obviously has a relation to both volume and pressure in as much as more foot pounds will be needed to lift the fluid the greater height, and also as friction and velocity will necessarily increase with the longer flow. This results in the need for greater pressure and volume with depth and in a lower and lower percentage of efficiency as measured by the delivery of useful work.

Size of pipe also has an influence on the pressure and volume of air needed. A pipe of large cross section relative to the amount of fluid to be lifted will reduce friction but increase slippage and necessitate excess volume of air. On the other hand too small a pipe will cause excessive friction and result in high pressures with low efficiency.

It may thus be seen that the pressures and volumes for maximum efficiency relate to the height of the lift and to the cross section of the pipe relative to the volume being lifted. For each condition of depth and cross section of pipe and relative quantity of fluid to be lifted, there is a certain relation of volume and pressure that will give the greatest efficiency, but the engineer applying the air-lift in the oil fields should not only know how to estimate the point of greatest efficiency but also how to best meet other conditions, such as low rock pressure, or how to get the greatest daily production from a large well if that is desired.

Use of Tapered Tubing

The use of tubing tapered downward is based upon the fact that as a gas approaches the top of a well the pressure becomes less and it expands and flows with increasing rapidity, thus greatly increasing the velocity. This is shown graphically in Figure 1, which represents a comparatively shallow well. This velocity accelerates to the point that the friction becomes enormous in deep wells. At the bottom of the well, the upward flow of the oil and gas is relatively slow and probably much too slow for efficiency considered from the standpoint of slippage. On the other hand, near the top of the well the flow is much too fast considered from the standpoint of friction; therefore the need is for a design which in effect will increase velocity at the bottom of a well and decrease velocity towards the top.

These considerations, long recognized, have led to the design of tapered tubing, which has been applied for many years in air-lifting water. The factors to be considered here are the practical design of tapered tubing under conditions met in the oil field.

To design a tube so there would be a constant velocity from top to bottom would mean that the cross section of the tube should be increased upwardly in proportion to the expansion of the gas as shown in Figure 3, but this is obviously impossible in deep oil wells, and in fact would theoretically not be efficient because it would make for extreme slippage and friction, and the downward tapering of the tubing must be based on an intermediate factor so that the most efficient design will be one with an increasing velocity upward but at not such a rate as in a straight pipe. In a well, especially a deep well, the use of tapered tubing is necessarily restricted to the size of the casing. There is a limit to the size that can be used at the top and to design a tubing in the correct proportions would make it far too small at the bottom of the well. As a matter of fact, in a well of considerable capacity, it will be found that the use of any tapering can be made only by sacrifice of daily production, as a smaller size of tapered tubing would so restrict the cross section of the pipe as to unduly limit the flow and create high frictional resistance that would result in a high back pressure. This would be especially true where the end sought is the greatest daily production so that early in the life of the field it may not be practical to use any tapered tubing when the conditions are competitive.

As the well gets smaller so that less volume need be handled, then it will become possible to use tapered tubing effectively and this will result in a greater mechanical efficiency, if properly designed, and also lower back pressures at the bottom of the well.

When it comes to deciding on the taper, the engineer will have three problems: First, the practical limitation of the larger size that can be used at the top of the well; secondly, the smallest size that can be used at the bottom of the well to handle the volume of fluid without undue frictional resistance, curtailment of production, or back pressure; and, thirdly, the proper proportioning of the pipe as between the maximum size at the top and minimum size at the bottom. For efficient operation the gradations cannot be made at random because there should be a mathematical relation be-

[1]Davis, George Jacob and Weidner, C. E.: An Investigation of the Air-Lift Pump, Bulletin No. 667, University of Wisconsin, 1914.

IDEA

DUPLEX SLUSH

14½ X 7½ X 18

ASK FOR
DESCRIPTIVE
BOOKLET
Nº 13 N

THE NATIONAL SU

AL
SH PUMP
UPPLY COMPANIES

tween the lengths of the different sizes which will evolve the best compromise between the factors of slippage and velocity.

In connection with the use of tapered tubing, it may be pointed out that if this proves of sufficient importance, it would be possible in many instances to case the well with a string of pipe with larger sizes near the top that will permit taking advantage of this principle in deep wells, where the need for it is greatest.

Surface Flow Lines

As the velocity towards the top of the well becomes increasingly greater, the factor of frictional resistance is of even greater moment at the surface of the ground than in the well itself. Shaw has called attention to surface equipment that has been designed to reduce frictional resistance to a minimum and incidentally to reduce the back pressure at the top of the flow column in the well. This is applying correct and acceptable practices which have been used in the lifting of water, where the equipment for separation of air and water has received close attention. The value of reducing frictional resistance at the top of the well by having large flow lines and separating the gas from the oil as close to the well as possible is exceedingly important, as can be shown by theoretical considerations backed by experience; for example, if the flowing pressure is 20 atmospheres and the pressure at top of the flow column in one case is 4 atmospheres, and in the other case 2 atmospheres, the expansion in the first instance is 5 times and in the second instance 10 times with a resultant doubling in energy delivered. Of course, the useful work delivered is not doubled because of the increased velocity, but the overall efficiency in almost every case will be increased considerably by keeping down the top pressures, which can be effected by proper design of surface flow equipment. The reduction in flow pressure is likewise reduced to an important extent.

Other Factors Relating to Efficiency

In addition to the factors discussed on the efficiency of the air-lift are many others, of which space will not permit more than mention. These include sizes of air and flow pipe, designs of foot pieces, air ejection, the relative merits of annular and tubular flowing, the solubilities of air and gas and their relative advantages, the use of booster holes, intermittent air-lifts, and many others. As to these factors but a few points can be made.

The air pipe can always be smaller than the flow pipe, yet there can be a surprising loss in pressure in deep wells in small air pipes which should be guarded against. To handle much fluid the flow pipe should be large, but if there is little fluid the slippage losses will be excessive and in fact the air-lift may be inoperative. Where the fluid becomes small, tapered tubing should be used. Whether to use the central pipe as the air or flow pipe is mostly a practical matter as to the quantity of fluid to be flowed, corrosion problems, and so on. Foot pieces have been elaborately investigated and found to have but small influence on efficiency. The values of different designs of the air injectors have also been exaggerated. Too little reliable and comparative data has come to the writers' attention as to the relative merits of gas and air to warrant the expression of any opinions. The intermittent air-lifts involve more practical differences than theoretical differences.

Gas-Oil Ratio

There has been much interest displayed as to the effect of the air-lift upon oil recovery. The evidence considered has been curves showing the decline before and after the application of the lift and data showing the differences between the gas-oil ratios before and after use of the lift. Evidence and opinions have differed and a general confusion is apparent as to both principles and results. The misunderstanding as to the use and significance of the gas-oil ratio is especially notable, therefore it has been deemed advisable to set out what the writers believe to be correct principles and use of this factor.

Some years ago the junior author[3] suggested the use of the volume of gas compared to the volume of oil as the medium of recovery efficiency, which since has been commonly termed the "gas-oil ratio" or "gas factor," but in applying this principle some of the fundamental elements have apparently been entirely overlooked, one of which is that the gas-oil ratio is a measure of relative efficiency where other conditions are the same, and, secondly, that efficiency finally comes down to a matter of both

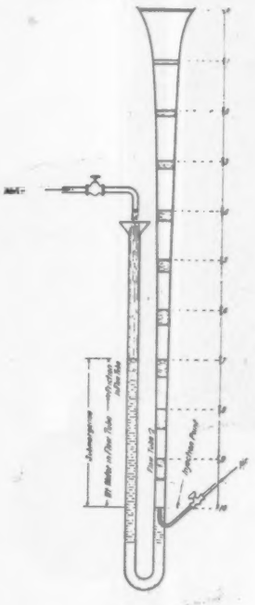


FIGURE 3

pressure and volume of gas; that is, to the energy contained in the compressed gas which expels the oil. In the voluminous discussions of gas-oil ratios, we have seen no consideration of the fundamental principle, which is that the oil represents the useful work done by the energy contained in the gas, which should be measured by volume and pressure in terms of horsepower or foot pounds of work.

As a practical thing, however, the gas-oil ratio as measured in volumes can be used when limited to conditions otherwise comparable, which is in measuring efficiency of methods of operation on the same well at about the same time; that is, if in operating the well the back pressure is changed, the difference in efficiency can be measured by the volume of gas alone, for within the short time between the changes in operation there will ordinarily be no important change within the sand body and in the well. But in making such comparative tests each method of operation should be continued long enough that there be complete readjustments of pressure and other conditions underground.

Where, however, the gas-oil ratio is used to compare the efficiency of a process as applied to two different fields, two different properties, or even two different wells, it does not take into account the differences in the energy represented by a given volume of gas, so that under such circumstances, it is essential that the pressure factor be taken into account and that the relative efficiencies be represented on a true comparative basis; that is, in foot pounds of work, but, in comparing the efficiencies in recovery between different wells, pools or properties, it must be borne in mind that the efficiency of recovery is mostly determined by underground conditions, and, in measuring the efficiency of recovery at a well, one measures the frictional resistance and slippage in the forcing of the oil through the sand to the well primarily, and secondarily the effect of the manner of operation of the well upon these recovery factors.

There is also much confusion among both engineers and operators as to the function of the gas-oil ratio in that the opinion seems to be prevalent that the gas-oil ratio is a cause of efficiency, whereas, it is only a measure of efficiency, just like the thermometer is a measure of a change in temperature but does not cause a change in temperature. The value of the gas-oil ratio is that it provides a simple and practicably usable means of measuring the sum of the results from the complex relation of many factors underground and in the well, which include the pressure, nature and volume of the gas, the distance the gas and oil have to travel to the hole, the resistance of movement of the oil through the sand by reason of friction, viscosity, adhesiveness to the sand grains, and other factors which consume or waste energy.

In as much as the gas is a means for forcing the oil out of the sand, we are interested in so applying the means as to get a maximum quantity of useful work from it, the useful work being represented by the oil delivered to the tanks. In the sense as outlined here, the use of the gas-oil ratio, which more correctly could be termed the gas-pressure-oil-ratio, is as fundamentally correct as a similar use in measuring the efficiency of the gas-lift alone or in a steam engine, gas engine, or any other mechanical contrivance deriving its energy from an expanding gas. We believe the question as to its utility as a measure of oil efficiency has come about through a misunderstanding of its fundamental principles and the resulting misapplication and confusion as to its utility. Until the engineers clearly understand and correctly apply these principles, the same confusion will exist.

Cubic Feet of Gas per Barrel of Oil Alone Not the Determinig Factor of Efficiency of Production

In order to point out the fallacy of basing oil recovery efficiency on gas-oil ratios only, we will work out two specific problems, which problems represent approximately the conditions existing in two pools with which we are familiar, taking one well from each pool, which hereinafter will be designated as A and B.

Well A is 4,000 feet deep and has 1,200 pounds absolute rock pressure, and is flowing with 200 pounds absolute pressure at the sand face and 15 pounds absolute pressure at the well head. It is producing 3,000 bbls. of oil per day with 1,500,000 cubic feet of gas of a gravity of 1.

Well B is 2,000 feet deep and has 325 pounds absolute rock pressure in the sand, and is flowing with 122 pounds absolute pressure at the sand face and 33 pounds absolute back pressure at the well head. It is producing 600 bbls. of oil with 600,000 cubic feet of gas per day of 1 gravity.

In case A there is required 500 feet of gas to produce a barrel of oil from the sand, and

In case B, there is required 1,000 feet of gas to produce a barrel of oil from the sand.

Assuming adiabatic work by the gas, the number of foot pounds required to expel the oil from the sand in

Case A is 5,560,000,000
and Case B is 1,110,000,000

and the foot pounds per barrel in

Case A is 1,855,000
and Case B is 1,855,000

That is, the actual energy used to expel 1 bbl. of oil from the sand is the same in A as it is in B, even though twice the number of cubic feet of gas per barrel of oil was used in B.

Still assuming adiabatic work of the gas, the foot pounds of work in the gas in expanding from the sand to the surface in

Case A is 2,680,000
and Case B is 2,680,000

but this quantity of gas or energy was not sufficient to keep the wells flowing steadily under the above conditions, and it was in each case necessary to supply additional air.

In case A, there was supplied an additional 1,500,000 feet per day, making a total of 3,000,000 feet per day.

In case B, there was supplied an additional 600,000 cubic feet of gas per day, making a total of 1,200 cubic feet per day.

Therefore, the foot pounds of work used in lifting the oil from

Case A is 16,000,000,000
and Case B is 3,200,000,000

per barrel in

Case A is 5,360,000
and Case B is 5,360,000

and the efficiency of lifting the oil only, by the gas assuming isothermal expansion, and 86 specific gravity of the oil in

Case A is 22.3 per cent
and Case B is 11.15 per cent

Estimating Compressor Capacity

The following problem is given to show what size compressor and engine would be required to furnish the additional gas necessary to flow the two representative wells in the previous example.

Assuming adiabatic compression, and allowing 30 per cent for loss in friction and slippage in the compressor end and 85 per cent mechanical efficiency for the machine, the horsepower of the gas engine to pull the compressor which would deliver the necessary air would be in

Case A, 335 horsepower
and Case B, 112 horsepower

and the number of feet of gas per day required as fuel to operate such an engine, assuming 14 per cent thermal efficiency and a gas of 1200 B.t.u. per cubic foot, would be in

Case A, 129,000 cubic feet per day
and Case B, 41,000 cubic feet per day

For example:

Suppose it were necessary to furnish all the energy necessary or used by these

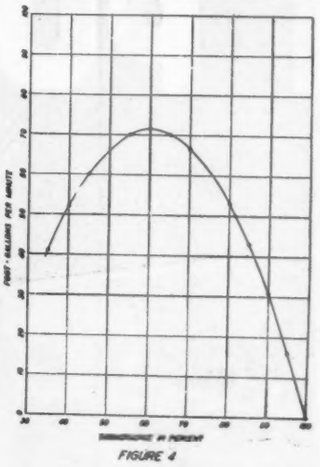


FIGURE 4

two wells in the expulsion of the oil from the sand, and raising it to the surface, in

Case A we would have to install a 1,214-horsepower unit
and in Case B we would have to install a 287-horsepower unit

or, in other words, the actual horsepower expended in producing a barrel of oil from

Case A is .405
and Case B is .478

and in this case the overall efficiency, or the relation between the amount of energy in the fuel necessary to run such a compressor as compared to the actual energy delivered in expelling and raising the oil in

Case A would be about 2 per cent
and in Case B would be about .8 per cent

Relation of the Air-Lift to Oil Recovery Efficiency

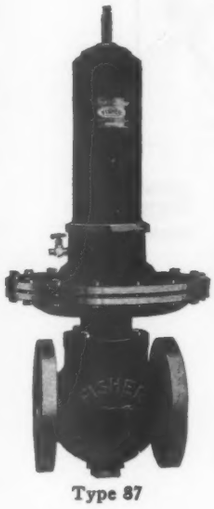
It has been necessary to divert from the subject in hand in order to prepare the ground for a discussion of the relation of the air-lift to efficiency in oil recovery. There have been some claims of mysterious effects of the air-lift on recovery as measured by gas-oil ratios, and on the other hand, there have been claims that the air-lift has been detrimental as measured by the same criteria.

So far as the writers can see, the air-lift has two effects on the efficiency of oil recovery; one, by reason of changes of back pressure against the sand and the other by reason of its effect upon the condition at the bottom of the hole. The last factor is comparatively of less importance, and, therefore, will simply be covered by stating that the gas-lift tends to remove the sand, mud and other matter

(Continued on Page 161)

[3] Lewis, James O., Bulletin No. 148, page 118, United States Bureau of Mines, 1916.

Over
A THIRD OF A CENTURY
of Quality



Type 87

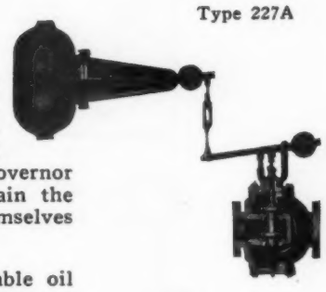
Fisher plant in 1880.

FOR over a third of a century The Fisher Governor Company has been identified with the creation and production of regulating devices. The name of Fisher on a regulator insures its being of the highest and best quality. Consider that, in specifying specialties on Federal power plant jobs, the U. S. Government says, "Fisher or equal," and you have an idea of what Fisher quality signifies. Fisher products have been prize winners over a long period of time and the hardest task The Fisher Governor Company has now is to maintain the standard they have set for themselves in the past.

Recognized as builders of reliable oil and gas regulators, Fisher products are in constant everyday service to the Oil Industry—in every part of the world. *The sun never sets on the users of Fisher products.*

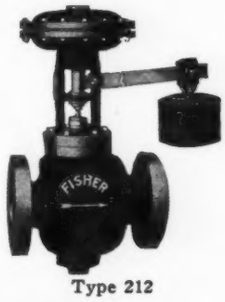
If The Fisher Governor Company does not have a regulator to fulfill a specific need already as standard equipment, they will devise and build it . . . Fisher engineers are equipped for any contingency. Submit any problem you may have—they will devote every effort—scientific principle—wide experience, to its solution.

Type 227A



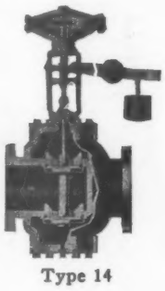
Type 33

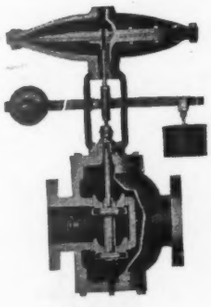
Type 240



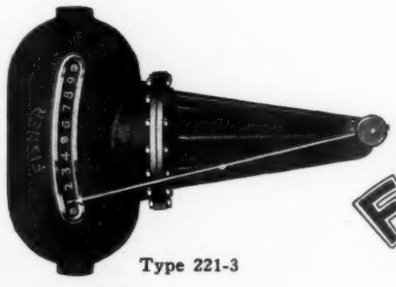
Type 212

THE FISHER GOVERNOR COMPANY
400 Fisher Bldg. Marshalltown, Iowa, U. S. A.


Type 14


Type 88

Type 210



Type 221-3

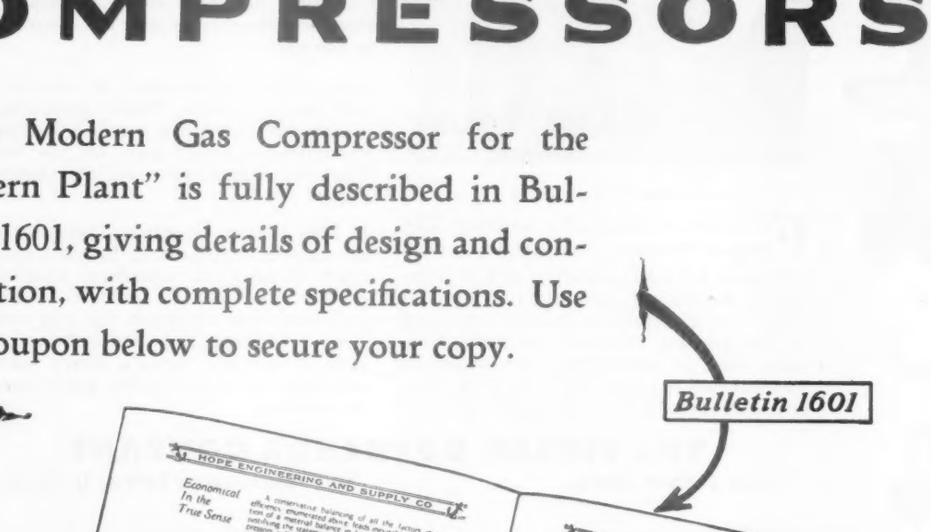
FISHER
TRADE MARK
REGISTERED

The Fisher Governor Company present-day plant.

HOPE
VERTICAL
COMPRESSORS

"The Modern Gas Compressor for the Modern Plant" is fully described in Bulletin 1601, giving details of design and construction, with complete specifications. Use the coupon below to secure your copy.

Bulletin 1601


HOPE ENGINEERING AND SUPPLY CO.
Economical In the True Sense
MOUNT VERNON — OHIO — U. S. A.
Design and Structural Details
General Data

The Coupon

Name _____

Mailing Address _____

City _____ State _____

Company _____

HE-43

HOPE
ENGINEERING AND SUPPLY
COMPANY
MOUNT VERNON, OHIO, U.S.A.
DALLAS, TEX. TULSA, OKLA. CASPER, WYO.

Seminole Air-Gas Lift Installations

Mechanical Features Described and Methods of Application Explained. Natural Flowing Life of Wells Very Short

By Clifton R. Swartz*
Petroleum Engineer, Bureau of Mines

Illustrations referred to in this paper are shown in full page of pictures on page 110, this issue.

The use of compressed air or gas in oil wells for raising crude oil to the surface has, within the last year, become a dominant factor in production engineering. Previous application of this principle was largely confined to oil wells that had been pumping for a considerable length of time. In the Seminole area, the gas-air lift has been applied to wells immediately after natural flow has ceased and in some cases while the wells were still flowing. This early application of the gas-air lift has been watched with intense interest by the petroleum industry, both with respect to methods of application and mechanical installations and to the effects on immediate and ultimate production. This paper will cover the mechanical installations.

Methods of Application

The Seminole Pool at its inception contained sufficient gas associated with the oil to cause natural flow. As no free gas was found in the main productive horizon, the Wilcox sand, all the gas present was dissolved in the oil, hence the natural flowing life was short, rarely lasting over 45 days. When natural flow ceased, high fluid levels were common and as depth and crookedness of holes were obstacles to efficient pumping, the gas-air lift was used almost exclusively in raising the oil to the surface.

Because of the high gravity of the oil, 41 degrees A.P.I., and its high gasoline content and also because of the desire to obtain production before offset wells became productive, quantity of production was the aim of the operators and a method of flow was used whereby this aim could be fulfilled. One of the outstanding features of this method consisted in flowing the wells through the annular space between the tubing and casing. By this means a greater quantity of fluid could be handled than by flowing through the tubing of the size in ordinary use. Wells that would produce only a few hundred barrels on the pump, were by this method made to produce as high as 7,000 bbls. on the lift. A few days or weeks of production at that rate meant a large recovery of oil.

Six and five-eighths-inch casing was commonly used as a production string with a 5⅛-inch liner set on top of the oil sand. Two and 2½-inch upset tubing was used for introducing the gas and air. The tubing was lowered within a few hundred feet of the top of the oil sand and sufficient air or gas was introduced at the required pressure to cause the well to flow. In a few cases fluid levels were measured and the desired depth for the tubing was calculated from these measurements. Tubing depths were frequently changed to increase daily production.

Flow Reversed

When production had declined to such an extent that the annular cross-sectional area between the tubing and casing was more than sufficient to accommodate the quantity of production, the flow was reversed[1] in order to reduce the excessive amount of air or gas which was required when flowing through the casing. Some of these changes were successful in that they maintained or nearly maintained the previous rate of production and at the same time reduced the compressor requirements. More often, however, the results were unfavorable from the viewpoint of the operator, as the decrease in production more than offset the advantage gained by the reduction of the air or gas requirements. One or two companies used tapered tubing ranging from 2-inch at the bottom to 5⅛-inch at the top. (Plate 1). In most cases the use of tapered tubing was successful, resulting in lower working pressures, reducing the quantity of gas used and maintaining about the same rate of production. In one well production was increased about 50 per cent.

Pressures usually necessary to start flow varied from 250 pounds to 750 pounds, depending principally on the depth of tubing in the fluid column and the gravity of the oil, resistance due to friction being negligible. Pressures higher than 750 pounds have been recorded and on one well a pressure of 1,400 pounds failed to start flow. No attempt was made to reduce starting pressures by "rocking pressures" or "super-flushing" as practiced in the Texas Panhandle[2].

Flowing Pressures

Flowing or working pressures varied from 50 pounds to 700 pounds depending upon the method of flow. In the use of tapered tubing pressures as low as 50 pounds were recorded and with flow through tubing of uniform diameter pressures were as high as 700 pounds. The majority of wells were flowed through the casing, however, and the average working pressure on these wells was about 190 pounds.

Gas and Air Required

The quantity of gas or air required per well per day varied greatly, ranging from 400,000 cubic feet to 1,200,000 cubic feet, the average being from 750,000 to 800,000 cubic feet. 800,000 cubic feet is used in the field in designing pressure plants. When production had declined to such an extent that the cross-sectional area between the tubing and casing was more than sufficient to accommodate the decreased quantity of operation, operators continued to flow through the casing notwithstanding the fact that this method required excessive amounts of gas. This can be explained by the fact that most operators wished to maintain the established rate of production. When flow was changed either to tapered tubing or tubing of uniform cross-sectional area, a smaller quantity of gas was required but with a decreased rate of production, even though better efficiencies with respect to gas-oil ratios were obtained. The lowering of fluid levels also accounted for relatively more gas being required to lift the oil.

Well Connections

Connections at the well head were of simple design when flowing through the casing. A suitable tubing packer and support of sufficient strength to withstand starting pressures was screwed into the control head or directly on to the casing. Several companies designed their own tubing packer. (Plate 2). A pressure gauge at the well head recorded the working pressure.

Flow Lines

Oil flow lines were 4-inch and 6-inch directly connected to the control head or to the casing below the well head connections. One design of special interest had the flow line welded to the casing below the derrick floor and at such an angle that the flow line led directly to the trap where with a slight bend it connected with the trap. (Plates 3 and 4). The general practice was to eliminate all right angle bends between the well head and the trap to lessen resistance to flow. (Plates 5 and 3).

Traps were placed on elevated platforms adjacent to the derrick and high enough to permit the oil to flow by gravity to the stock tanks. Traps varied in size from 4 feet by 12 feet to 8 feet by 20 feet. Common commercial traps and separators were used.

Connections for Flow

The first installation of flow connections at wells did not allow for reversal[1] of flow, consequently to change the method of flow, the connections at the well head had to be changed. (Plates 1 and 4) shows well connections for the reversal of flow. In the use of tapered tubing (Plate 1) a different type head was used to accommodate the larger size tubing at the well head. By regulation of the necessary valves, flow could be directed through tubing or casing.

Compressor Plants

Starting pressures, working pressures, and cubic feet of gas or air used per well per day were important factors in selecting compressor equipment. The plants ranged in size from the small portable plants of three compressors to the larger semipermanent and permanent plants having as many as 30 compressors. The size of compressors ranged from 9½ inches by 4 inches by 10 inches in the smaller plants (Plate 6) to 16 inches by 8 inches by 20 inches in the larger plants. The number of wells to be flowed and the amount of gas required per well per day determined the number and size of compressors. Very few tests were made on wells to determine the amount of air or gas required per day and installations were usually made according to the average input per well per day as determined by previous operations. Three to four small compressors 9½ inches by 4 inches by 10 inches; two 80 horsepower compressors, 9¾ inches by 5 inches by 20 inches, or one 160 horsepower 15 inches by 7¼ inches by 20 inches, were used per well. The size of cylinders could be changed on the larger compressors allowing for changes in plant capacity.

The above sizes were capable of delivering 800,000 cubic feet of gas or air per day at working pressures up to 500 pounds and starting pressures up to a 1,000 pounds. Compression was always two stage.

The smaller compressors were belt driven with 75 or 100 horsepower electric motors whereas the larger sizes were direct driven with gas engines.

Distribution System

Two general plans of air and gas distribution were used, one employing the header system in conjunction with a central plant supplying a large number of wells. The other system consisted of a battery of compressors directly connected to an individual well. The header system was more commonly used. Many variations in the header system were evident but all accomplished about the same results. The manufacture of gasoline in connection with lift work resulted in special designs of plants. The majority of plants provided for a working header and a high pressure header for starting wells. Starting headers were divided into as many as four sections, so that each section could be used simultaneously in starting a well, thus allowing four wells to be started at once. Several plants contained intermediate headers between high and low compression which with fuel and water headers made as high as seven headers per plant.

Plate 7 and 8 shows a portion of a plant using the header system. The flow of gas in this plant is as follows: The gas enters the system through two scrubber tanks, thence to a 15½-inch intake header to the low compression cylinders, compressed to 50 or 55 pounds and discharged into a 10-inch low pressure discharge header. From the low pressure discharge header the gas passed through condensing coils to a 18-inch by 7 feet low pressure gasoline accumulator. Gasoline was removed by an automatic gasoline trap. From the low pressure accumulator the gasses passed to a 12-inch high intake header, thence to the high compression cylinders and was compressed to about 250 pounds, passing direct through the cooling towers to the high pressure gasoline accumulators. From the high pressure gasoline accumulators the gas passed to a working header and was distributed to individual wells through volume control devices and orifice meters. From the high pressure gasoline accumulators the gas could be directed to a high pressure starting header capable of handling four wells at one time

Compressor equipment in this type of plant just described consisted of five 165 horsepower Bessemer compressors, having 15 by 7¼ by 20 inch cylinders and eight 80 horsepower Bessemer compressors, having 9¾ by 5 by 20-inch cylinders.

The water circulation in plants was either forced feed or gravity flow. Some plants used individual cooling towers for jacket water and others used water from the condensing tower. The system were so connected that water could be used from either source.

Where headers were not used, (Plate 9), the distribution of gas through the plants was very similar. The gas passed through scrubber tanks to a 20-inch low intake header, thence to the low compression cylinders and compressed to 50 or 55 pounds. After low compression, the gas passed directly through the condensing towers to the low pressure gasoline accumulator, thence to the high compression cylinders and after compression passed to the high pressure accumulators, then to a regular pipe line manifold. This permitted the distribution of gas from any compressor to any well. No volume control devices were used on this type of plant, the volume being regulated by pinching the intake valves on the compressor or pinching the valve controlling the flow to wells. Orifice meters at the plant or well measured the flow of gas. Water circulation was either forced feed or gravity flow and was so connected as to permit flow from the cooling tower or from the condensing tower as in the plant using the header system.

Many variations were evident in both types of plants. (Plate 10 and 11). In many plants no cooling of gas and the extraction of gasoline was attempted after high compression, the gas going directly to the wells. Nearly every plant allowed for the extraction of some gasoline between low and high compression. The coolers used to extract gasoline were either the shell type placed vertically or horizontally or coils sprayed by water.

In each of the two general types of distribution there are advantages and disadvantages relating to the use of gas and air and the utilization of power. Under the header system compressor capacity can be fully utilized as only the number of compressors necessary to flow the wells need be used. The break down of a compressor does not shut down a well as other compressors can take on the load of the broken compressor. Pressure carried on the header must necessarily be greater than the largest pressure required to flow a well. Any defect in the header would cause the shut down of the entire plant.

Under the system in which the wells are directly connected to a battery of compressors, change from air to gas can be made one well at a time without shutting down the entire plant. Shut down of a battery of compressors means the

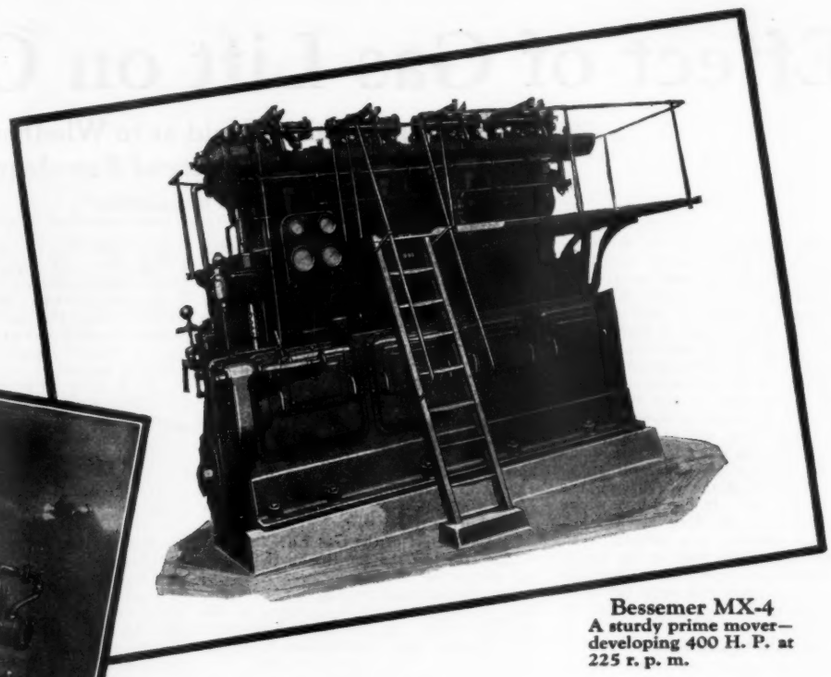
(Continued on Page 150)

*Presented by permission of the director, U. S. Bureau of Mines, before Fort Worth meeting of A. I. M. M. E.

[1]Reversed is used in the sense of changing the oil from flowing through casing to flowing through the tubing or vice versa.

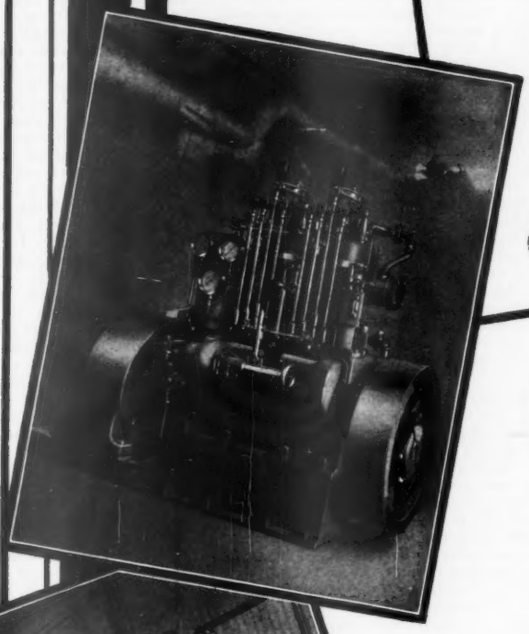
[2]Volume and pressure control for wells on gas lift, by E. O. Bennett and K. C. Sclater, New York meeting, A. I. M. M. E., 1927.

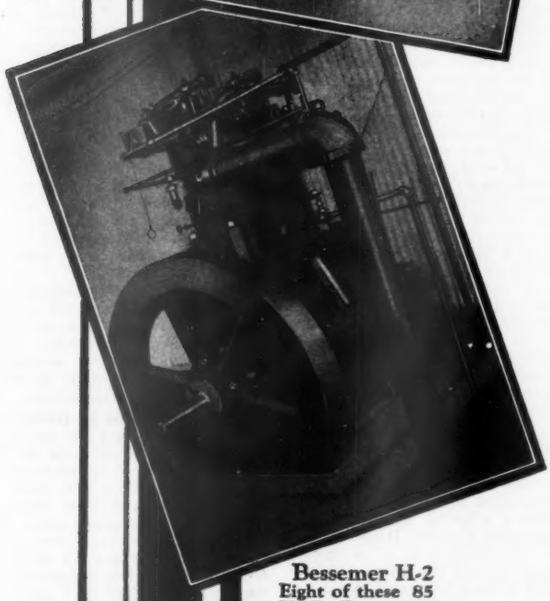
Mechanical Installations for air-gas lift
1
2
3
4
5
6
7
8
9
10
11



Bessemer MX-4
A sturdy prime mover—developing 400 H. P. at 225 r. p. m.

Bessemer E-2 generating sets are furnished in complete units with solid sub-bases, in units of 25 K.W., 40 K.W., 50 K.W. and up.





Bessemer H-2
Eight of these 85 H. P. Bessemer Deisels are in service as auxiliary engines in South America.

For Pipe Line Work

THERE is a Bessemer Diesel that will exactly fill your needs—whether for main pumping engines, auxiliary pumping engines or generating sets. Bessemer Diesels are of the four cycle solid-injection type and are built in sizes from 40 H. P. to 1250 H. P. with speeds ranging from 200 r. p. m. to 450 r. p. m. Their economy and reliability is the same for all sizes, and their performance is being continually demonstratad by scores of installations of all sizes on all types of work.

THE BESSEMER GAS ENGINE CO.
52 York St. ∴ ∴ Grove City, Pa.

BESSEMER
DIESEL ENGINES

Effect of Gas Lift on Oil Uncertain

Conflicting Opinions Held as to Whether Its Use Increases or Decreases Gravity of Petroleum Recovered

By R. R. Brandenthaler*
Petroleum Engineer, United States Bureau of Mines.

Petroleum producers in the Mid-Continent, up to the present time, have been more concerned with the mechanical operation and efficiency of the gas lift, than with its possible effects on the physical properties of the oil. As a result very little specific datum is available on the subject and contradictory opinions on the subject exist. Some operators are positive that the gravity of the oil is decreased, while others present data which definitely show that the gravity of the oil is increased. In other localities, some few operators have given careful attention to the effect of the gas lift on the gravity of the oil. In instances where the emulsions formed have given much trouble, the problem has usually been dodged by p'acing the well on the pump.

The data and observations set forth in this paper are presented with the hope that discuss'on by you will result in further investigation.

Certain Fundamentals

Certain fundamental results may be expected under ordinary conditions and with all types of crude oil, when gas is the prime mover of oil in producing formations. For example the gravity of oil w ll decrease as the rock pressure in the producing formation declines, the change being greater in the higher gravity oils.

Furthermore, the character of emulsion formed is primarily dependent upon the kind of oil, thus more refracto y emulsions are formed from asphaltic base oils, less refractory from mixed base oils, and the least refractory from paraffin base oils. However, refractory emulsions are sometimes formed from paraffin or mixed base oils that are difficult to treat by ordinary methods, especially by electrolytic processes. With oils having the same base, those of lighter gravity are less subject to the formation of emulsions and especially of refractory emulsions.

There are two types of emulsions formed, namely, water-in-oil emulsions and oil-in-water emulsions and of these, the former are the more common; in fact very few examples of oil-in-water emulsion have been noted in the oil fields. The amount of water produced with the oil influences the percentage of emulsion formed. Agitation and velocity of flow play an important part in the forming of emulsions.

Other Producing Methods

For comparison, the effects of other producing methods on the physical properties of crude oil are briefly summarized. In a natural flowing well in which water is present, surging will cause emulsions to form and the degree of emulsification is influenced by the extent of surging. By installing the correct size and length of tubing and applying pressure control, surging can be stopped temporarily. It may recur when the rock pressure declines in which event smaller diameter tubing replacing the former string may again eliminate it. In either case, by steadying the flow the velocity is increased to prevent the dropping back of fluid, thus lessening agitation which in turn lessens the percentage of emulsion formed. Swabbing, which causes agitation, may result in the forming of emulsions when the swab is run too low in the fluid and water is present. When a swab is used to skim the oil, emulsions are not formed so readily. Emulsions are also formed in pumping but to a lesser degree when carried on efficiently, than when other methods are used.

Changes in gravity of oil may be affected by the manner of application of the different producing methods. As the rock pressure declines the gravity of the oil decreases, but by controlling the well and trap pressures, the decline in gravity may be retarded or it may be temporarily increased. After the pumping stage has been reached, the gravity of the oil will remain fairly constant unless vacuum is applied in which event the gravity is generally decreased and the decrease is proportional to the amount of vacuum held.

In general, the producing of oil under pressure, results in an increase in gravity. This increase may be relatively small or often only sufficient to retard the natural decrease in gravity resulting from declining rock pressure and withdrawal of oil from the formation.

Effect of the Gas Lift

The effect of the gas lift on the physical properties of oil have been classified under the following headings: (1) Formation of emulsions; (2) changes in the gravity of oil; (3) changes due to heat; (4) changes due to oxidation when air is used.

As more data on these phases of the use of the gas lift become available, additional methods will be devised for overcoming the difficulties. Fortunately, in the Seminole area, where most of the gas lift work in the Mid-Continent has been carried on, emulsion problems have not been very serious. Th's is primarily on account of the kind of oil produced. Emulsions formed have been readily broken down without serious difficulty.

Formation of Emu'sions

A general survey of fields throughout the country indicates that the use of the gas lift, irrespective of the type of oil, results in an increase in the percentage of emulsions formed and also in more refractory emulsions. This condition is more pronounced in loca'ities where asphaltic base oil is produced. One engineer reports that in a number of wells operated by his company, the gas lift was removed because of the refractory emulsions formed. Greater ag'tation in the fluid column caused by the introduction of gas or air accounts for the increase in percentage and refractory properties of the emulsion. Possible exceptions to the general rule are instances where the velocity and pressures are controlled in a manner similar to that used by some companies in app'ying pressure control. That is either by installing the tubing at some distance above the sand and flowing through the tubing or by flowing through the tubing and holding pressure either at the well or trap.

As the percentage of water produced increases beyond approximately 15-20 per cent, the percentage of emulsion decreases. This condition holds generally with all types of oil and may be accounted for by the fact that the presence of a large quantity of water lessens the possibilities of films of water being formed and remaining around globules of oil.

In the Seminole area a natural flowing well produced 5,500 bbls. of oil and 6 per cent of water. A 7 per cent emulsion was formed which was eas'ly treated out with a small amount of tret-o-lite. The gas lift was then instal'ed and on the day of installation a 37 per cent water-in-oil emulsion was formed which was more difficult to treat. More tret-o-lite and heat were required to break down the emulsion. On another well in the same area a 4 per cent emuls'on was produced prior to installing the gas lift. After the gas lift was instal'ed, the emulsion increased to 64 per cent. Another well registered an increase in emulsion from 7 per cent prior to installing the gas lift to 82 per cent after installation. All of these wells produced from between the tub'ng and casing. In every instance where a large percentage of emulsion was formed the water produced did not exceed 15-20 per cent of the well's total daily production.

In the Tonkawa and Garber Fields, and especially in the latter field, large quantities of water are produced with the oil, and a relatively small percentage of emulsion is formed.

D. B. Dow[1] says, "The use of the gas lift may be advantageous in some fields but at most wel's pers'stent emulsions have been formed when the oil and water are agitated violently by the compressed air as they rise in the well. The persistence of emulsions formed in this way depends upon the character of the oil. In the Gulf Coast Field, where the air is used extensively, permanent emulsions that require special treatment are formed. In the West Columb a Field, Texas, cut oil produced in certain wel's in the east pool breaks down quite rapidly, whereas in the north field the emulsion is most persistent. However, the oil from the east pool is lighter in gravity and is produced at a higher temperature than that from the north f.eld."

Effect on Gravity

Logically, one would be safe in assuming that the introduction of air or gas would result in a decrease in the gravity of the oil being produced. The treated gas contains only such gaso'ine as has not been removed in the gasoline extraction plant, ordinar'ly not more than from one-tenth to one-twentieth of a gallon per 1,000 cubic feet of gas. When again recovered after being introduced in a well, the gasoline content has increased to one gallon or more per 1,000 cubic feet. As the oil must furnish the additional gasoline, it is reasonable to conclude that the gravity of the oil has been decreased. Tests made in the Mid-Continent have shown that the gravity of the oil has been actually increased when gas is used. With air the increase was only nominal, that is increases of only one or two-tenths of a degree were noted. Higher pressures and velocities probably account for the increase in grav.ty. Further investigation to determine whether the increase is temporary as I suspect it to be, would be interesting. The weathering of two samples, one obtained from a natural flowing well and another from a well on the gas lift may result in a change in our ideas. It has even been suggested that the decrease in gravity of the 'atter sample would be greater because of the removal of certain fractions by the scrubbing action of the dissolved gas.

A survey of the effect of air or gas on the gravity of the oil indicates that the effect differs to some extent with different types of oil, that is whether asphalt base, mixed base or paraff n base, the first being affected least and the latter being affected most. However, the gravity of the oil is more of a factor than the type of oil, oils with a higher gravity being subject to greater change.

Changes in the volume of gas used also affect the gravity of the oil, larger volumes resu'ting in a gravity decrease.

A series of tests carried on in the Seminole area gave the following results: Over a period of five days of natural flow, the gravity of the oil averaged 39.4 degrees A.P.I. The average gravity over a period of 20 days on the gas lift amounted to 40.7 degrees A.P.I. When the gas was replaced by air, the average gravity during a period of f.ve days was 39.5 degrees A.P.I. Thus, when air was used there was an apparent increase of 0.1 degree A.P.I. in the gravity of the oil and an increase of 1.3 degrees A.P.I. with gas over natural flow.

Another test conducted on seven wells over a period of 10 days resulted in no apparent increase with air and an average increase of 1.04 degrees A.P.I. when gas was introduced. The oil samples were obtained at the trap. This increase in gravity was also noted in the pipe line runs. Some companies report a decrease in gravity of oil in the Seminole area, but I have no definite information to substantiate this statement.

A series of tests on eight wells were made on another type of oil in another section of the country. The average gravity during natural flow was 28.7 degrees A.P.I. and when on the gas lift it was 28.6 degrees A.P.I., a difference of only one-tenth degree.

Four other wells in the same locality were tested, with the fol'owing results:

Average gravity during natural flow, 25.8 degrees A. P. I.

Average gravity during gas lift flow, 24.8 degrees A.P.I.

Average per cent oil during natural flow, 0.8 per cent.

Average per cent cut oil during gas lift flow, 0.73 per cent.

Gasoline content of crude oil during natural flow, 21.3 per cent.

Gasoline content of crude oil during gas lift flow, 18.3 per cent.

The gravity of the oil had been decreased one degree. Average per cent of cut oil during natural flow and while on the gas lift was approximately the same. A decrease of 3 per cent in the gasoline content of the crude occurred while the gas lift was used.

Changes Due to Heat

The utilization of heated gas or air in flowing wells has been used primarily for decreasing the viscosity of low gravity oils and in a number of instances the increase in production has been very noticeab'e. As practically all-gas lift work is confined to high gravity oils in the Mid-Continent very little data are available on the subject. From a general observation of field operations in this area and discussion with other engineers, I have concluded that the use of preheated gas has not resulted in a permanent increase in gravity of oil produced or in an increase in oil production in the Seminole area.

Increasing the temperature of an oil renders it less viscous but at the same time allows for less gas to be dissolved in it at higher temperatures. Thus, with an oil of the character produced in the Seminole area, the gravity of crude would be less at higher temperatures.

Changes Due to Oxidation

It is poss.ble that the use of air has resulted in some oxidation of the crude oil, an example of which was called to my attention. One well while flowing naturally produced 39.6 degrees A.P.I. gravity oil of a greenish color. No water was present. Ten days after the air lift was installed the gravity of the oil had decreased more than 1 degree A P.I. and the oil had changed to a slightly yellow color. Information on the subject of oxidation of crude oil when air is used is contradictory. Without more conclusive proof, I would hesitate to state that oxidation actually takes place. It is hoped that further investigation will be carried on to furnish data on the problem.

Conclusions

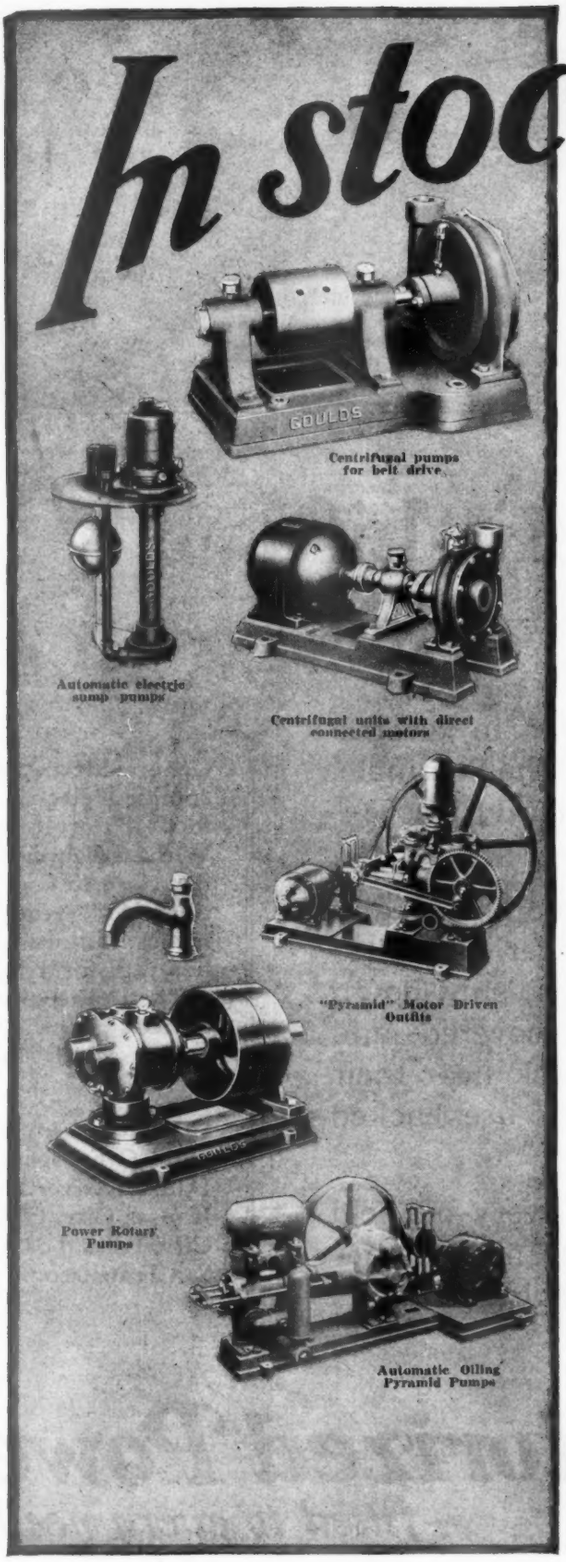
In dealing with the effect of the gas or air lift on the physical properties of oil, the method of application is important. Ag'tation of the fluid column can be minimized by making the proper type of installation, and with correct operation.

Flowing between tubing and casing results in greater agitation on account of the tubing collars and further disturbance in flow at the well head between the

(Continued on Page 150)

*Presented by permission of the director, United States Bureau of Mines, before the October, 1927, meeting of the A. I. M. M. E. at Fort Worth, Tex.

[1]Dow, D. B., "Oil Field Emulsions." U. S. Bureau of Mines Bulletin 250. 1926.


Centrifugal pumps for belt drive
Automatic electric sump pumps
Centrifugal units with direct connected motors
"Pyramid" Motor Driven Outfits
Power Rotary Pumps
Automatic Oiling Pyramid Pumps

In stock—

small power pumps for a multitude of purposes

These small and medium capacity pumps are adaptable to a wide variety of uses in industrial plants of all kinds. Some of their many uses are:

Handling fuel oil, kerosene and gasoline; unwatering excavations; pumping enamel, paint, varnish and other viscous liquids; loading and unloading tank cars; circulating liquids in manufacturing processes; circulating brine; booster service; water supply, etc.

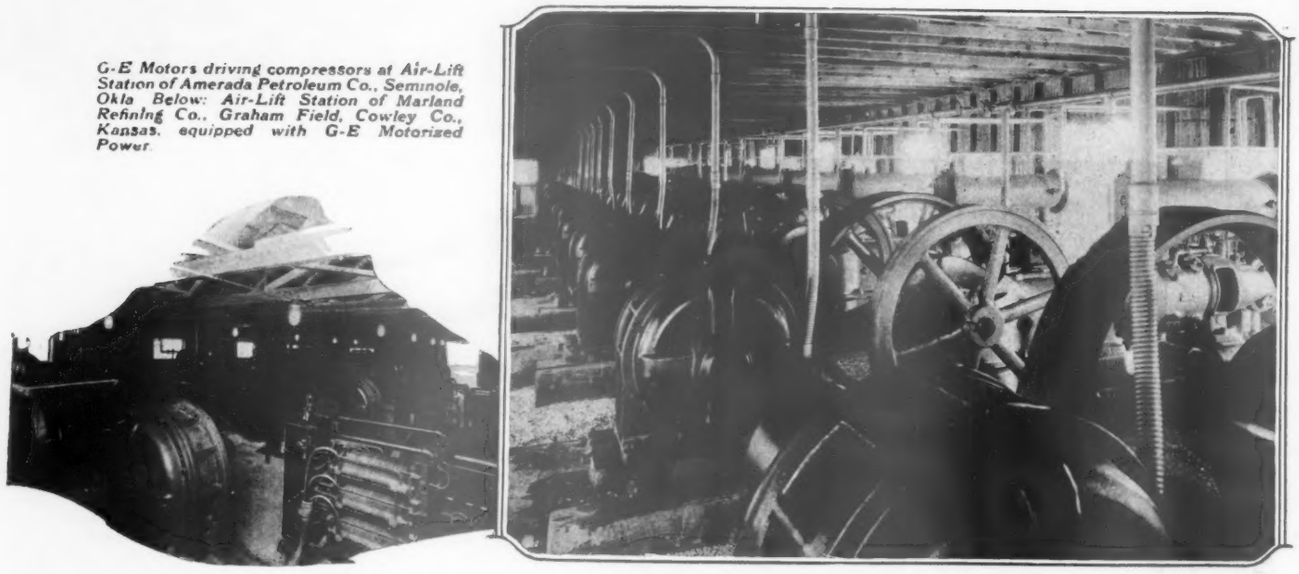
Carried in stock at our factory, branch warehouses; and at supply houses everywhere.

GOULDS PUMPS
Centrifugal, Triplex,
Rotary, Vacuum, etc., for

Air Washing and Humidifying
Building Equipment Services
Elevator Service
Booster Service
Ice Water Circulating
Sump Pump Service
Heating Systems
Construction Work
Unwatering Excavations
General Water Supply
Fire Protection
General Water Supply in
Hotels
Apartment Houses
Office Buildings
Industrial Plants
Irrigation
Mine and Quarry Service
Drainage
Cyanide Mills
Flotation Plants
Refineries
Waterworks, Filtration and Sewage Plants
Petroleum Industry
Oil Pipe Lines
Oil Refineries
Gasoline Plants
Process Work—
including such industries as:
Coke and Gas
Chemical—Cellulose—Paper—Food—Sugar—Tectile.
Refrigerating Plants
Steam Power Plants
Boiler Feeding
Economizer Service
Condenser Service
Fuel Oil

Goulds Pumps, Inc.
Seneca Falls, N. Y.
Date .....
Please send pump bulletins and specifications for—
Kind of Service .....
Name .....
Position .....
Company .....
Address ..... O&GJ 10-20-27

GOULDSPUMPS
Incorporated
Seneca Falls New York



G-E Motors driving compressors at Air-Lift Station of Amerada Petroleum Co., Seminole, Okla. Below: Air-Lift Station of Marland Refining Co., Graham Field, Cowley Co., Kansas, equipped with G-E Motorized Power.

Motorizing the Air-Lift

A sudden big demand for motorized air-lifts! G-E motors were ready.

Of the first 5000 horsepower in electric motors purchased last fall for the Seminole, Okla. field, 4000 h.p. was General Electric—mostly for air-lift work.

G-E motors, time-tried in the oil fields, and proof against shut-downs, were installed because oil operators knew that shut-down losses are seldom, if ever, recovered—and that G-E motors were in stock near their operations, ready for immediate use, backed by G-E service.

The air-lift development in every oil field finds G-E Motors, G-E Service, and on-the-spot distribution a powerful tool to its hand.

General Electric supplies complete electric equipment to the oil industry. With warehouse facilities close to your operations, G-E readily furnishes motors, controllers, transformers, arresters and other protective devices, capacitors for power factor improvement, etc.

G-E oil field specialists and G-E service at: Dallas, Denver, Houston, Kansas City, Oklahoma City, Tulsa, Los Angeles, San Francisco.

Apply the proper G-E Motor and the correct G-E Controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power

Motorized Power
—fitted to every need

200-52A

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Mechanical Installations of Gas Lift

Factors in Production in Texas Other Than in the Gulf Coast. Control of Differential Pressure

By E. V. Foran*
Production Engineer, Marland Oil Co. of Texas

There are many factors which control the ultimate production of oil and gas from a producing formation and the rate at which this production is obtained from any of the producing wells in the formation. The most important of these, and the one over which the greatest control can be exercised is the differential pressure existing between the formation and the well bore. In producing any well by means of the gas lift, it may be possible to change the flow tubing in a number of ways or vary the volume of circulating gas or air used for flowing the well, but if these operations, regardless of their magnitude, do not change the differential pressure between the producing sand and the well bore, they will in no way change the production of the well. If this statement be accepted as a fact, then all gas or air-lift installations should be designed with but one object in view, namely; a means by which we can economically control very wide ranges of differential pressures between the formation and the well bore.

Factors of Production

In gas-lift production from any given formation, there are four major factors which govern the magnitude of the differential. They are: (1) The depth of the well; (2) type and size of flow tubing; (3) volume of the circulating air or gas, and (4) physical properties of the oil-gas mixture after it has reached the well.

The first of these factors mentioned is uncontrollable and does not vary. The other three are controllable within certain limits.

The degree to which the last three factors can be controlled will entirely govern the length of life of the well while on the lift, the lifting cost, and the daily production. It will also govern to some extent the ultimate production from the wells or leases producing by this method. These four factors will be discussed in detail in another part of this paper. Before proceeding further, a review of the present general practice in Texas, other than the Gulf Coast region, will be given.

Panhandle Area

Nearly all of the gas-lift wells in this area are from 2,900 to 3,200 feet deep. The tubing sizes in the wells vary from 2½ inches to a maximum of 4½ inches, depending upon the size of the well. Due to the extremely rapid deposition of paraffin in the flow tubing, it is necessary to clean the tubing daily or every other day by means of a mechanical scraper, the operation of which has been described in detail by Bennett and Sclater[1].

Mixed flow strings in the Panhandle area are not used as they would require a different size scraper for each section of the tubing where a change in the diameter occurs. This to a certain degree, limits the efficiency obtainable as the entire 3,000 feet, more or less, of tubing is of the same diameter and therefore, will have a widely variable ratio of velocity between the bottom and top of the well. For the most efficient operations it would seem that the velocity ratio of the gas-oil mixture throughout the tubing should be kept as nearly constant as possible. This point will be further discussed in another part of this paper.

The position of the bottom of the tubing varies in different wells. In some cases it is kept at 600 feet above the top of the producing formation, and in other cases, it is set at a point just above the top of the producing formation. It is believed that if the tubing were set at certain points within these ranges, that maximum efficiency would result.

The required working input pressures to flow wells in the Panhandle varies from approximately 100 to 225 pounds per square inch. Under these conditions, the gross gas-oil ratio varies from 2,200 to 3,500 cubic feet per barrel of oil. The net gas-oil ratio from the sand varies from 200 to 600 cubic feet per barrel. The starting pressures required on these wells vary from 250 to 500 pounds per square inch.

The power for compression used in the Panhandle area is both gas engines and electric motors. The gas is separated from the traps and passed through gasoline compression plants and then into the high pressure stations. In some cases dry gas is compressed to the required pressures and transmitted to the lift wells. The rock pressures in the Panhandle lift wells vary from approximately 175 to 400 pounds per square inch.

West Texas Area

Gas-lift methods of production in the new fields of West Texas are occupying considerable attention. During the past six months, the air and gas lift has been employed in the Crane-Upton County area by the Humble, Tidal, Gulf, Marland, Simms, Landreth and other companies. In the Howard County fields, some preliminary experiments have been conducted but there are, as yet, no permanent plants. In the Noodle Creek Field in Jones County, the Marland Oil Co. has been operating by gas-lift methods during the past eight months.

In the McCamey area, both the Marland and Roxana companies have tried to overcome the difficulties encountered in handling the corrosive H_2S gases, but success has been limited and marked by frequent interruptions in the operations of the plants. The production in the McCamey area comes from lime at about 2,100 to 2,300 feet. The tubing used in these wells is 2½ and 3-inch. It is usually set 300 or 400 feet off bottom and the input air pressure at the casinghead varies from 160 to 200 pounds. Air is used as insufficient gas is available for this purpose. The corrosive action of the air and sulphur gases is so severe that tubing must be replaced in these wells every six weeks. This gas cannot be used for the engines as it will completely burn through the piston head in three or four months.

The Church and Fields University Pool in Crane County is probably the most active area of gas lift operations in Texas, at the present time. The production from this area comes from a lime formation from 2,600 to 2,700 feet in depth.

Surface Equipment

One of the outstanding features of the operations in this pool is the type of surface equipment used. All of the plants are equipped with compressors capable of delivering gas for starting pressures as high as 600 pounds and in some cases to 1,000 pounds. Volume-control meters are installed in nearly all cases where gas is being delivered from a high-pressure header to several wells which require different input pressures. Air is used to flow the wells as there is insufficient gas for this purpose. Not all of the gas-lift wells are equipped with meters to measure the well's output gas, although there is a meter on each input well. This, of course, makes it impossible to say just what the net gas-oil ratio is.

The tubing sizes vary from 2½ to 4-inch, depending upon the size of the wells. The gross gas-oil ratio in this pool seems to be very low, the majority of the wells averaging from 700 to 1,100 cubic feet per barrel. The input casinghead pressures on the other hand are rather high, averaging from 150 to 215 pounds. Some of the wells making around 400 bbls. have working pressures as high as 175 pounds per square inch.

The tubing position in these wells in most cases ranges from 250 feet to as high as 550 feet off bottom. This is due in part to the high starting pressures off bottom and in other cases it is based upon the supposition that the most efficient tubing position for a gas-lift well is at some critical point which may be anywhere from the top of the pay to a point several hundred feet up the casing. The results in this field show possibilities of long life for the gas lift, if it will be possible to reduce the working pressures against the face of the producing sand as the rock pressure becomes depleted.

Noodle Creek Field

In the Noodle Creek Field in Jones County, the Marland Oil Co. has made a radical departure from conventional tubing sizes and arrangements as well as plant design and methods of gas recirculation. Due to the curtailment in drilling operations in March, 1927, only one well was put on gas-lift production. This was a 1,400-bbl. well and was placed on the lift February 4, 1927, 12 days after the well was completed. The production in the pool is from a lime formation at 2,510 feet. The initial rock pressure of this field was abnormally low, showing approximately 330 pounds per square inch.

A 4-inch flow tubing was specified for the well but was unobtainable at the time, and a 5⅜-inch casing was used as a flow string. The well was completed with 8-inch casing. Recording meters for gas measurements and pressures were installed at both input and discharge sides of the well. Air was forced down the 8-inch casing and the oil flowed up the 5⅜-inch tubing in violent heads every 55 minutes at the rate of 780 bbls. per day. This was unsatisfactory and a 2½-inch tubing was run inside of the 5⅜-inch and the gas forced down the 2½-inch tubing and the oil produced between the 2½ and the 5⅜-inch. The result was a steady flow at 1,085 bbls. daily with a gross gas-oil ratio of 905 cubic feet per barrel and the input pressure at 195 pounds.

This arrangement was considered satisfactory and the following week additional air was forced into the well and the input pressure dropped to 160 pounds and the well increased its production for a short time. After the well had been on the air lift three months, the daily production fell below 500 bbls. and the input pressure had dropped to 124 pounds and the lifting gas-oil ratio increased to 1,600 cubic feet per bbl. The well showed indications that it could not flow much longer under the 124-pound input pressure, due to the rapid pressure depletion in the sand on account of this well being offset by three other producers.

Radical Change

At this point it was decided that a radical change in both the tubing arrangement and compressors would have to be made in order to obtain the desired lower input pressure.

The high-pressure cylinder of a two-stage tandem-driven compressor was replaced by a low-pressure cylinder and the volumetric capacity of the compressor was doubled. Both the 5⅜ and 2½-inch tubing were pulled and a mixed string consisting of 275 feet of 3-inch tubing as the lower part, and 2,226 feet of 5⅜-inch casing as the upper part of the tubing was run in the well. The total tubing length was 2,501 feet. This placed the bottom of the tubing 8 feet above the top of the sand.

The well was then put on production and the input air pressure required to flow it was only 60 pounds. Six pounds black pressure was indicated on the casinghead. This low pressure against the face of the sand resulted in an increase in the effective drainage area of this well, which, in turn, resulted in a decline rate much slower than before the change was made.

Although the increased volume of input air on single stage compression gave results in contrast to those observed before the tubing change was made, it also presented some disadvantages, the greatest of which was the reduction of the gravity of the oil from 39.5 degrees to 38 degrees A.P.I., due to increased gasoline losses which were escaping to the air as there was no gasoline plant available to recover the vapors which tested 1 2 gallons of gasoline per 1,000 feet. The daily popoff to the air was 950,000 cubic feet. This indicated a loss of 1,140 gallons of gasoline daily.

It was then decided to recirculate the output air-gas mixture from the well and allow any condensate which might occur after compression to return to the well instead of installing condensing coils following the compressor discharge. This process resulted in an immediate rise in the gravity of the oil from 38 degrees to 41 degrees A.P.I. and an increase of 24 bbls. of oil per day which represented the vapor losses in the air-gas mixture formerly escaping to the air. The gas was separated at the trap under a pressure of 7 pounds and delivered to the compressor intake at 5 pounds above atmosphere. This increased the compressor output 25 per cent above the free air capacity and resulted in a lower input pressure on the well. It is, therefore, apparent that this practice may open new possibilities to gas-lift operations which will result in a higher overall efficiency of ultimate production. This can be attained through the installation of a tub-

(Continued on Page 130)

DAILY OPERATING CHARACTERISTICS, MARLAND OIL CO.'S NO 3 MASON, NOODLE CREEK FIELD, JONES COUNTY, TEXAS.

	Daily Production Bbls.	Input Pressure Lbs.	Input Gas Cu.Ft.	Output Gas Cu.Ft.	Gross Gas cu.ft. per bbl.	Net Gas cu. ft. per bbl.	A.P.I. Gravity	
February 10	1,084	195	786,000	981,000	905	180	40 0	Used air for input.
March 10	788	143	767,000	952,000	1,228	245	39 8	Used air for input.
April 10	629	127	724,000	978,000	1,555	404	39 7	Used air for input.
May 10	484	120	731,000	947,000	1,956	446	39.5	Tubing compression changed May 13.
June 10	402	63	846,000	1,016,000	2,521	416	38.0	Air input single-stage compression.
July 10	364	60	947,000	1,024,000	2,812	212	41.0	Recirculation of wet gas at 5-lb. intake pressure at compression.
August 10	321	55	1,065,000	1,150,000	3,616	265	41 0	No change in operation.
September 10	315	53	970,000	1,045,000	3,318	238	41.0	No change in operation.

*Before midyear meeting of Petroleum Division, A. I. M. E., Fort Worth, Tex.

Copyright, 1927, by the American Institute of Mining and Metallurgical Engineers, Inc.

[1] E. O. Bennett and K. C. Sclater; Some New Aspects of the Gas Life Petroleum Development and Technology in 1926, 115.

Gas Factor and Production Efficiency

Variables Which Influence It as a Measure of Effectual Operation Explained. Conclusions Are Listed

By Lester C. Uren*
Professor of Petroleum Engineering, University of California.

Field studies and laboratory research have established the fact that the expulsive force which drives petroleum into wells, from the reservoir sands in which it is stored by nature, is primarily an expression of the energy latent within compressed natural gas dissolved or occluded in, or otherwise associated with the oil. Each barrel of oil produced is forced into the recovery well by the expansive energy of a certain volume of compressed gas, originally stored with the oil in the pores of the reservoir rock; and each cubic foot of gas so produced with the oil and expanded to atmospheric pressure, reduces by so much, the total natural energy available for oil expulsion. So important has this relationship between the volumes of gas and oil produced seemed, that petroleum production technologists have come to regard the "gas-oil ratio", or the "gas factor" as it has been more conveniently termed, as a measure of oil production efficiency. Different methods of oil recovery and production devices are now compared on this basis and estimates of ultimate recovery obtainable through their use are considered by many to be inversely proportional to the values of their respective gas factors.

The writer has been among those who have given support to a widespread movement toward a proper recognition of the significance of the gas factor as a guide in the control of producing oil wells and does not wish to in any way oppose its more extended application. It seems necessary, however, in view of the almost elemental faith with which the principle of the gas factor has been received in many quarters, to point out that it is a most complex factor, and one which cannot be regarded as an absolute index of production efficiency without due regard to other contributing factors by which it is influenced to an important degree. The mere recording of a low gas factor obtained through the use of some method or device, does not necessarily imply efficient oil production; and conversely, a high gas factor does not always signify inefficient recovery. Other variables must also be taken into consideration, and when these are given due weight, it may at times be found that the well producing with a relatively high gas factor is the more efficient. It is the purpose of this paper to review factors which influence the gas-oil ratio, explaining the effect of each, in the hope of arriving at a more complete understanding of the significance and range of application of this useful index of production efficiency.

Decline of Field Pressure

It is a fact well known to all, that the volume of gas at atmospheric pressure which may be produced from a cubic foot of formational gas, is a function of the pressure with which the gas is stored in the reservoir sand, and yet this fundamental principle seems to have been lost sight of by many who indiscriminately compare gas factors obtained from wells of all ages and producing under widely varying field pressures. If a certain amount of energy is required to force a given volume of oil through the reservoir sand into a well, it is clear that provision of this energy will require the expansion of a larger volume of gas when the field pressure is low, than is necessary when the formational gas exists under relatively higher pressure. Consequently, it is natural to expect that the gas factor will range progressively to higher values as the well ages, or as a field is drained of its gas in the normal course of development.

In comparing the efficiencies of different wells, we are interested not so much in the actual volumes of gas produced with the oil, but rather with the energy consumption represented in the expansion of this gas from the pressure at which it existed in the oil sand. When reduced to the energy basis of comparison, it will often happen when the efficiencies of two wells are compared, that the one showing the highest gas factor will be producing its oil with a lower unit energy consumption. For example, suppose that in case No. 1, a well is producing with a gas factor of 1,500 cubic feet per barrel from a formation pressure of 250 pounds per square inch; while in No. 2, 1,000 cubic feet of gas is produced with each barrel of oil, but the formation pressure is 500 pounds per square inch. Here well No. 2 has the lower gas factor, but is producing its oil with an energy consumption of approximately 2.2 times that of No. 1. It is submitted that a more appropriate basis of efficiency comparison would be the product of the gas factor by the number of times the volume of the gas has increased in expanding from the formation pressure to that at which its volume is measured.

Advancing Age of Wells

In addition to declining formational pressure, the advancing age of a well is accompanied by the developed of oil-drained channels within the more permeable component members of the productive zone, through which gas finds a ready means of escape to the wells. Gas is thereby enabled to pass through the sands from points remote from the wells, without comparable movement of the oil. Oil entering the wells is thus produced in association with gas only a small portion of which may have had any influence in bringing about its movement through the sand. The gas factor is by this means greatly increased.

There would seem to be no means of estimating with any degree of accuracy, the extent of gas channeling, though it unquestionably increases with the age of the wells, and with the amount of oil drained from the sands. Intensity of development as exemplified by close spacing of wells will no doubt also have an important influence in rapidly developing gas channels. Intersection of drainage cones about closely-spaced wells may quickly develop oil-drained channels through which gas is free to migrate over great distances.

If these considerations are valid, the conclusion is inescapable that lapse of time, resulting in partial drainage of oil and greater freedom of movement of gas throughout the productive formation, will lead to gradual increase in the gas-oil ratio of producing oil wells.

Variation of Gas Factor

The energy necessary to force oil through the reservoir sand over a given distance to a well outlet, will of course depend upon the resistance to flow offered by the reservoir sand. Fine-grained sands having small pore spaces and composed largely of angular grains of rough-surfaced minerals, offer materially greater resistance to passage of oil through them than coarser and more porous media composed of well rounded smooth-surfaced minerals. The flow resistance is also influenced to an important degree by the viscosity and surface tension of the oil, low values for these properties permitting greater freedom of movement of the oil through the restricted apertures of the reservoir sand.

The resistance to movement offered by the sand will primarily determine the amount of energy necessary to accomplish expulsion of the oil, though the rate of flow and the distance over which the oil must travel will also be determining factors. High sand resistance resulting from either small size of sand pores, high viscosity of oil, high rate of flow or long transmission distance, will tend toward increase in the gas factor, and vice versa. Any means of reducing the sand resistance to flow of oil and gas, such as forming cavities about the wells within the oil sand, should also be effective in reducing the gas factor. Obviously these physical variables cannot be ignored in estimating the relative efficiencies of producing wells by comparison of their respective gas factors.

Release of Gas From Solution

The solubility of gas in petroleum decreases in straightline relationship with pressure. Accordingly as pressure is released within an oil-bearing formation by production of a part of the oil and gas, much of the remaining gas, though originally in solution in the oil, assumes gaseous form and exists within the oil in the form of minute bubbles. These occluded gas bubbles become trapped within the sand pores and it is by reason of their continued expansion that oil is ejected. Experimental data indicate that the fluids move through the drainage channels in chains of alternating oil filaments and gas bubbles, the latter continually expanding due to decline in pressure as they approach the well outlets.

While expanding gas bubbles are thus largely responsible for the ejection of petroleum from the sands, it is also true that they interpose considerable resistance to flow. As each gas bubble passes from pore to pore of the reservoir sand through the restricted communicating channels, it must be subjected to considerable distortation, a requirement which in the aggregate occasions great energy loss. Furthermore, as the pressure declines and the occluded gas bubbles increase in size, the energy necessary to force them through the sand increases.

For a given pressure drop, less energy is consumed if the final or delivery pressure is high than if it is low, for the gas bubbles will have a smaller average size and they will therefore be more easily forced through the sand. If an elevated delivery pressure is maintained, there is a relatively greater percentage of the space within the drainage channels available for movement of oil and consequently more oil flows. This is in all probability why maintenance of back pressure on a well permits of production of oil with a lower gas factor than is possible when the gas is fully expanded, and explains also why the ultimate production of oil is increased thereby.

It is to be noted, however, that the advantages gained by maintenance of an elevated delivery pressure are offset to some extent by the energy latent within the gas bubbles not fully expanded on admission to the well. That is, the saving in energy secured by establishing conditions which limit the size of the gas bubbles with the oil, and the energy loss occasioned by permitting them to escape from the oil sand before they are fully expanded, are opposing factors, and maximum efficiency can be secured only by obtaining a proper balance between them. In other words, for any given condition, there is a certain back pressure or delivery pressure which, if maintained, will result in a minimum energy loss and a maximum ultimate oil yield.

Experiments conducted under the supervision of the writer have indicated the essential truth of this theory. In these experiments, gas-saturated oil contained within the pores of an unconsolidated sand in a steel pressure tank, was permitted to escape through a miniature well penetrating the shell of the tank. In successive experiments, sand, oil and initial pressure conditions were maintained precisely alike, except that the miniature well was required to discharge the oil under variable, controlled back pressures. Variation in back pressure was obtained by inserting small "beans" or flow plugs having different sized apertures, in the flow line. The rate of oil flow and total yield was accurately measured in each experiment and production graphs constructed which closely resemble production records plotted from actual field data.

The writer has seen comparable field data secured from actual producing wells, which prove without doubt that controlled back pressure will result in increased oil recovery, and that there is a certain definite pressure for every set of conditions which will result in maximum yield. Determination of this most efficient back pressure is admittedly a difficult problem, and even though we are able to determine it precisely for a given well at a particular time, it does not remain constant, but continually changes as the formation pressure and volume of oil flow decline.

Application of back pressure to producing wells results in reduction of the gas factor, as explained above, the volume of gas produced with each barrel of oil decreasing as the back pressure increases. Up to a certain point, this conservation of gas results in increased ultimate recovery, but beyond this point the energy lost in gas not fully expanded, as discharged from the well, exceeds that conserved by reduction of the gas factor, and thus the ultimate recovery is diminished. Too low a gas factor, if obtained by increasing the back pressure above the critical point, may therefore be indicative of reduced production efficiency rather than the reverse.

Recovery Rate

Experiments on the resistance offered by sand to the flow of oil containing occluded gas bubbles through its pores have shown that the resistance to flow varies with some power of the rate of flow in excess of unity. That is, to double the rate of flow, something more than twice as much energy is required. It follows, therefore, that gas energy may be conserved by reducing the rate of production of oil wells, and if a producer is content with a lower production rate he may, within certain limits, secure a greater ultimate recovery from his property. This would normally be accomplished by applying back pressure which would result in a lower gas factor.

Well Spacing

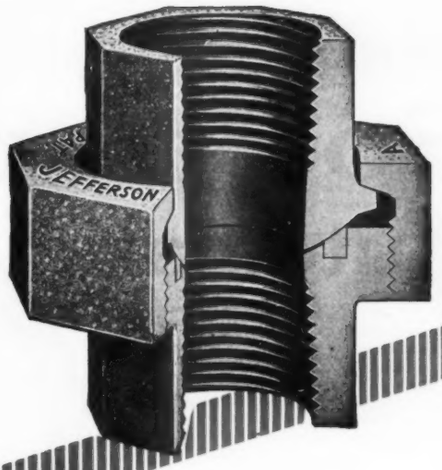
In a previous section of this paper, it has been shown that gas channeling through oil-drained spaces within the sand is responsible for increase in the gas factor, and that this increase is accelerated as drainage proceeds. Such action is promoted by close spacing of the wells, overlapping drainage cones permitting extensive gas migration over wide areas.

It has also been demonstrated that the energy loss in moving oil through the sand is a function of the rate of flow, increasing as the flow increases. Experimental data indicate that due to the radial flow characteristics of fluids draining into wells, the rate of flow is greatly increased in the immediate vicinity of the walls of the wells. Computations indicate that more than half of the total energy loss in moving oil through sand over a 300-foot drainage radius toward a 6-inch well, occurs within 10 feet of

(Continued on Page 137)

*Midyear meeting of Petroleum Division, A. I. M. E., Fort Worth, Tex., Copyright, 1927, American Institute of Mining and Metallurgical Engineers, Inc.

UNIONS with the Jefferson-PERFECTED Brass Seat



The Jefferson brass seat ring is located in a recess away from the runway of the fitting, and is forced into this recess under such pressure that it becomes practically one piece with the iron.

This seat ring *cannot be loosened* by expansion or contraction of the metals. It *cannot be injured* by screwing pipe far into the fitting. It gives the Jefferson Union a brass-to-iron joint which is LEAK-PROOF and NON-CORROSIVE.

All Jefferson Unions have convenient ball joints, with the parts ground together and kept in pairs until assembly. Made of the best grades of brass and air-refined malleable iron, and rigidly inspected, by an institution devoted *exclusively* to the production of dependable unions.

JEFFERSON UNION COMPANY
Lexington, Mass., U. S. A.
Handled by All Leading Oil Industry Jobbers

JEFFERSON

The Foxboro Automatic Volume Controller

Foxboro Controlled Gas Lift Means Greater Oil Production

Gas Lift is the modern method of stimulating oil production. But the flow of air or gas to the well must be automatically controlled to get the best results.

The Foxboro Automatic Volume Controller:

Properly proportions the volume of gas or air to the wells;

Permits the manifolding of gas compressors into a single large header.

Enables wells to operate continuously at a predetermined rate;

Saves the services of men who otherwise would put all their time on this job;

Gives an infallible daily record of control of gas going to the wells.

It is a combination of proved principles used in Foxboro Standard Instruments for more than ten years.

This instrument is also being used to control the rate of flow of oil to pipe stills. It balances the whole operation. One oil company estimates a saving of $10,000 a year from the use of one instrument alone.

The Foxboro Co., Inc.

Neponset Avenue, Foxboro, Mass., U. S. A.

205 So. Cheyenne Ave., Tulsa, Okla.

NEW YORK PITTSBURGH CHICAGO CLEVELAND BOSTON ROCHESTER PHILADELPHIA ATLANTA LOS ANGELES DETROIT SAN FRANCISCO PORTLAND, ORE.

FOXBORO

REG. U. S. PAT. OFF.

THE COMPASS OF INDUSTRY

Instruments for Indicating, Recording and Controlling Temperature, Pressure, Humidity and Flow

Paraffin Troubles in Eastern Fields

Patented Process of Burning Has Given Best Results. Solvents Are Claimed to Be Better Than Chemicals

By Frank M. Brewster*
General Superintendent, Petroleum Reclamation Co.

The handling of congealing oils and paraffin is a serious problem in the Appalachian fields, not that it is any worse than in other fields but because of the small amount of oil produced per well makes the removing of paraffin a very costly operation. Few operators realize or have any means of knowing just how much production is lost due to the paraffin depositing over the face of the sand and plugging the pores of the sand. But where paraffin has been removed the production increases indicate that this loss has been considerable.

Many operators are of the opinion that paraffining is confined to the tubing and pumping equipment but it is evident that the most serious damage occurs on the face of the sand and extending a short distance back into the pores. This paper is an attempt to disseminate information on methods and processes in use in the Eastern fields for combating losses of production and operating difficulties caused by deposition of paraffin in the pores, on the walls, on the tubing and other pumping equipment. A Bureau of Mines report of investigation by Mr. Mills[1] covers this subject so thoroughly that excerpts, abstracts and quotations from his work have been used freely in this paper.

Paraffin

Mills states: "The so-called paraffin that collects in oil wells and in the pores of the producing sands immediately around the wells, is generally made up of amorphous wax or uncracked paraffin, asphalt, or other gummy hydrocarbons mixed with more or less water, oil and inorganic silt. Some of the samples of this 'paraffin' collected from oil wells in different fields and examined by the Bureau of Mines contain as much as 20 per cent by weight of water and inorganic silt, whereas other samples are composed entirely of waxy hydrocarbons and oil. The inorganic silt accompanying this 'paraffin' is mostly fine sand, clayey materials, common salt, and finely disseminated precipitates of calcium and magnesium carbonates. Sulphates of calcium, barium and strontium are less common constituents of paraffin.

Principal Causes of Paraffining

"1. The chilling incident to the sudden reduction of pressure and expansion of gas in the wells and in the producing sands close to the wells. (Lowering the temperature only a fraction of a degree often causes the deposition of paraffin from oil containing its full capacity of dissolved paraffin).

"2. The diminished solubility of the paraffin at the lowered pressures generally prevailing in the wells. (Paraffin is more soluble in oil and gas at higher pressures).

"3. The churning action of the pumps and sucker rods which tends to accentuate the emulsification of water, oil and silt.

"4. The evaporating and drying action of natural gas. The evaporation of the more volatile constituents of the oil leaves behind the paraffin residues to be deposited in the wells and productive sands.

"5. The alternate wetting and drying of the productive sand exposed in a well where the fluid level is repeatedly lowered from the top to the bottom of the sand by pumping. Expanding gas tends to chill and dry the uncovered surfaces of sand. This wetting and drying cycle is comparable to repeatedly painting the exposed faces of the sand with paraffin.

"6. The leakage of certain kinds of water into wells, especially water carrying mechanically suspended silt or waters that carry dissolved salts which act chemically with the salts dissolved in other waters in the wells so as to form silty precipitates. The loss of carbon dioxide gas along with other dissolved gases from waters containing bicarbonates also causes the precipitation of silty carbonates, more especially calcium carbonate. The fine particles of silt seem to form the nuclei about which the oil and water emulsify to form some of the so-called paraffin materials."

Effects of Paraffin

Paraffin and its associated substances deposit on the face of the oil sand and in the pores obstructing the flow of oil into the well. This damage is serious and usually goes unnoticed as the deposition is a gradual accumulation growing progressively worse. As each well has its own individual characteristics the decline in production may seemingly be a natural decline approaching exhaustion and can be detected only by cleaning. Thus each and every well presents a different problem. However, the quantity and rapidity of deposition of paraffin in the tubing and other pumping equipment should give a very good indication of what may be happening to the walls of the hole and in the pores of the sand. The older the well, the greater is the paraffin menace as the long continued evaporation due to the gas passing through the pores and over the face of the sand hastens the deposition of paraffin. Naturally both gas and oil decline throughout the life of the well but generally the ratio between gas and oil increases throughout this same period. That is the decline of gas is not as great as the decline of oil. Thus the older the well, the greater is the amount of evaporation and paraffin per barrel of oil. Hence paraffining is an accumulating evil that may plug off the pores in the sand long before the well is exhausted by present production methods.

Paraffining of Equipment

Casing, tubing and pumping equipment are subject to paraffining but the damage is not as serious as paraffining of the sand. These troubles are readily apparent and can be remedied but at considerable cost.

The Forest Oil Corp.[2] has kept records of paraffin troubles and found the 9 per cent of their pumping and pulling troubles were due to paraffin. Their low percentage of paraffin troubles was kept to a minimum by frequent turning of the rods just as the tubing was filling with oil. (These wells are in the Bradford, Pa., and Allegheny, N. Y., water flood areas and pump considerable water along with the oil).

Doctor Garner[3] of the Hope Natural Gas Co. and affiliated companies estimated that 50 per cent of their production troubles were due to paraffin and that most of these troubles were in the well and not in the pumping equipment.

Mr. Goe[4] states: "I have had very little paraffin trouble in tubing for the last 20 years, or since I began the use of wire lines for pumping instead of rods. The action of wire lines in tubing keeps the paraffin cut and it is pumped out with the oil into the tanks."

Preventing Paraffining in Well

Several methods of preventing the deposition of paraffin in the pores and on the face of the sand have been used with partial success. But in practically all cases the paraffining has been retarded and not prevented. Two methods are in general use and they are both back pressure methods. One is to keep the sand covered at all times with oil. The other is to hold a back pressure on the sand by partially cutting off the flow of gas from the well.

Back Pressure

Back pressures as high as possible without materially curtailing production should be held at all times on a producing well. This diminishes chilling by lessening the expansion of gas and evaporation of the lighter constituents as the oil and gas enter the hole. Also at higher pressures more paraffin is retained in solution. Back pressures may be held by a high fluid level maintained in the well or by closing or partially closing the casinghead or by a combination or both. Keeping the sand covered not only keeps the paraffin in solution or at least in suspension but also exposes no dry surface to which the paraffin can adhere and it is readily pumped into the tubing. Where water is produced along with the oil it will be necessary to put the perforations near or below the bottom of the sand and to place the working barrel at the top of, or such distance above, the sand to maintain a desired back pressure. A flood nipple placed just beneath the working barrel assures that the sand will not be exposed and the perforations at the bottom serves to keep the water off the face of sand.

Removing Paraffin

Several methods of removing paraffin from the face of the sand and out of the pores adjacent to the wells have been tried with partial success. No completely satisfactory method has as yet been devised but a few methods give promise of successful development.

These methods are cleaning, shooting, reaming the sand, the use of solvents such as gasoline, benzol, etc., heating and melting by steam, hot water, hot solvents and chemicals and by burning with chemicals or combustible mixtures introduced and ignited opposite the face of the sand.

Cleaning Out

Cleaning out with tools removes loose sand, slate, muck or other materials that have fallen into the hole but it does not to any great extent remove the paraffin from the face of the sand or its pores. Cleaning out with high pressure air or gas has the advantage that it does reach the walls of the hole and tears off any loose particles but it also has a tendency to plaster over the face of the sand and drives soft materials into the pores and fissures, thus defeating its purpose. Present methods of cleaning out must be supplemented with other methods or agents if paraffin is to be completely removed.

Shooting

Shooting after a well has been cleaned out has been very successful in melting and burning paraffin off the face of the sand. In addition it breaks down the walls of the hole, exposes fresh rock and opens up new fissures and fractures. Too heavy and frequent shooting causes excessive caving with long drawn out cleaning jobs. Successively larger shots are necessary to be effective due to the increasing size of the hole. In soft sand very small shots should be used as there is danger of driving paraffin back into and packing the sand. But the main objection to shooting is the cost. Each successive shot is necessarily larger and more costly and at the same time the production increases are smaller. Shooting is also limited to wells having no casing near the shot as there is danger of bursting or collapsing the casing.

Reaming

In conjunction with cleaning out several devices for reaming the sand have been made and successfully demonstrated but they have not been used to any great extent in the Eastern fields, probably due to cost and lack of adequate surface equipment. The principle and method of cleaning is highly desirable as the cleaning can be confined to any particular part of the sand needing cleaning and the size of the hole can be controlled at will.

Solvents

Gasoline, benzol, kerosene and crude oil have been used to dissolve paraffin. Gasoline does not readily dissolve paraffin so the common practice of dumping two or three drums of gasoline down the well attains only partial success. Kerosene and crude oil also exert a solvent action on paraffin but are only slightly better than gasoline. Benzol is a better solvent than either gasoline, kerosene or crude oil but the general use of these solvents is too costly for the partial success obtained. Heating any of the above solvents by steam, hot water or other methods increases their solvent action but they must be circulated as they may melt and dissolve the paraffin only to carry it back into the sand and redeposit it on cooling. Hot solvents should be bailed or pumped out while still hot. By circulating for several hours very good results can be obtained from the use of solvents. The solvent as pumped out should go through a cooling tank to deposit the excess paraffin and then be reheated before returning down the casing.

Steaming

Steaming is a common practice for melting paraffin off the sand and for cleaning tubing especially where boilers are available. But steaming is generally too costly and the results are not satisfactory for cleaning the sand. However, it is one of the quickest and cheapest ways of cleaning tubing. The usual procedure is to turn steam down between the tubing and casing. This melts the paraffin off the tubing and it is easily pumped out. The steam usually condenses before reaching the bottom of the hole and the hot water is pumped out along with the oil and melted paraffin. This method is hazardous as usually the steam is confined to the casinghead under pressure and the pressure may be great enough to force the melted paraffin back into the sand, thus making conditions worse. A better method is to run a string of 4-inch outside the tubing and to a depth below the working barrel. Then steam can be run down between the tubing and 4-inch and back under no pressure to the surface. This permits of continuous pumping while heating and applies no pressure on the sand. The heat melts the paraffin and the flow of oil into the hole washes it from the sand.

Where boilers are not available a crude method is to heat iron billets and lower them into the hole. This method is slow and where the shot hole is large it is almost an endless task to heat the fluid in the hole hot enough to do much good. It is also a dangerous practice as gas from the well may be ignited from the hot billets as they are put into the well. A much cheaper and more satisfactory method would be to use hot solvents and lower them in a dump bailer.

Chemicals

The practical value of chemicals and solvents depend on their cost. They are very satisfactory but their cost is usually prohibitive. Calcium carbide in sufficient

(Continued on Page 127)

*Before midyear meeting Petroleum Division, A. I. M. E., Fort Worth.

[1]Mills, R. Van A. The Paraffin Problem in Oil Wells. Bureau of Mines Serial No. 2,550, December, 1925.

[2]Dorn, Forest D., president of the Forest Oil Corp., Bradford, Pa. Personal communication August, 1927.

[3]Garner, J. B., director of Chemical and Engineering Research for Hope Natural Gas Co., Pittsburgh, Pa. Personal communication, July, 1927.

[4]Goe, H. M., superintendent, Hope Construction & Refining Co., Parkersburg, W. Va. Personal communication, July, 1927.

Problems in Handling Panhandle Oil

Paraffin Forms Protective Coating and Considerably Reduces Corrosion Expected. Experimental Heating

By William Victor Vietti, Ponca City, Okla., and William A. Oberlin, Fort Worth, Tex.*

Crude petroleum produced in the Texas Panhandle oil field is both an asphalt and a paraffin base oil and is further characterized by being a high gravity crude with an extremely high cold test. An 8-well composite of Panhandle crude showed the following characteristics:

Gravity—36.6 degrees A. P. I.
Viscosity—
61 sec. Saybolt at 100° F.
170 sec. Saybolt at 75° F.
1560 sec. Saybolt at 50° F. (stirring).
Cold test—60 degrees Fahrenheit.

Composition—Distillation test:	Per Cent
Gasoline	28.8
Kerosene	4.8
Gas oil	30.7
Fuel oil	34.7
Wax	19.2
Asphalt	13
Sulphur[1]	0.8

Subsurface Conditions

The original pressure in the formation in the Panhandle Field closely approximated 420 pound gauge or 435 pound absolute pressure. Temperatures taken indicate that the formation temperatures do not exceed 90 degrees Fahrenheit. The following temperatures are typical measurements taken on one lease:

TABLE 1—TEMPERATURES IN PANHANDLE WELLS

	Production		Temperature (Deg. F.)			
	Oil (Bbls.)	Gas (M.Cu.Ft.)	5 Ft. Off Bottom	10 Ft. Off Bottom	Top of Liner	At Surface
Well No. 1	120	1,000	86.5	86	74	65
Well No. 2	210	5,000	....	..	67	60
Well No. 3	450	2,500	....	..	73	62
Well No. 4	410	3,500	....	..	68	62

Both pressures and temperatures are subnormal for the average depth (3,000 feet) of the oil formation.

The effect of the gas expanding from the formation pressures to well and atmospheric pressures is shown very clearly by these results. The casings in wells No. 1, 3 and 4 were cemented above the pay; well No. 2 was not cemented. Some free gas was encountered in a formation above the oil pay and is not cased in wells Nos. 1 and 3. The gas entering the well in wells Nos. 2 and 4 comes through the liner, presumably from the upper gas, by means of a connection through the formation back from the well, or from a gas sand immediately above the pay. The point of entry of the gas into the well is clearly pointed out by the temperature measurements, and is at the top of the liner in wells Nos. 1 and 3, and through the liner in wells Nos. 2 and 4.

Occurrence and Handling of Paraffin

The separation of paraffin from Panhandle crude is localized almost entirely in the flow string. The amount of paraffin formed varies with each well, but can generally be said to increase with increased gas and decrease with increased oil production. Flow strings, when pulled out of a flowing well (which is flowed by gas entering under the casing), exhibit small amounts of paraffin down to 800 feet. Between 800 and 1,200 feet the paraffin thickened, and if not cleaned out, plugged the flow string in this section. From 2,000 feet down, the paraffin gradually disappears and the last few joints are practically free from paraffin. Paraffining occurs from the point of entry of gas up to 800 feet from the surface, and even to the surface when excessive amounts of gas are produced with the oil. The separation of paraffin seems to be controlled by the cooling caused by gas expansion.

Swabbing wells show a general paraffin condition throughout the casing. This is due to the swab carrying paraffin on both downward and upward travel. The swab will shove paraffin ahead of it on the down stroke and unless a vigorous head follows the swab, this paraffin tends to collect below the casing, restricting the hole area and also coming in contact with the oil pay. The paraffin collected below the casing gradually decreases the production of a well. It is cleaned out by the use of a string of tools and is often supplemented by the use of gasoline and kerosene. The swab with the check valve removed is used at first in flowing wells to clean out the paraffin collected in the casing. As a general rule, the frequent running of a swab in a flowing well handles the paraffin satisfactorily.

Infrequent or none-use of the swab results in the paraffining of the pay, and a large decrease in production. A comparison in this respect is available in the granite wash area. One well, 960-bbl. initial production, was cleaned of paraffin by running the checkless swab twice a day. This well was still producing 425-bbls. one year after completion. Another well, in an adjoining lease came in for 1,200-bbl. This well was allowed to flow until the paraffin plugged the casing. It was cleaned out with tools, using 60-bbl. of gasoline to hasten the process. This was repeated twice, using 90 and 120-bbl. of gasoline, respectively. Production was much smaller after each cleanout, and after the third cleanout the well was flowing 100 bbls. daily. This well is now a small producer, making around 25 bbls. daily. There is no question here but that the paraffin was driven into the formation by the action of the tools. This could have been avoided by cleaning the casing of paraffin every day, or every other day.

A study of paraffin conditions in each well determines whether the swab should be run twice a day, daily or even weekly.

Effect of Gas Lift and Flowing Through Tubing

The gas lift, and the practice of flowing through tubing, have considerably reduced the use of the swab and its attendant evil in the Panhandle. Different conditions were imposed on the wells, and to meet these better tools were devised to handle the paraffin. A paraffin cutter or "flow devil," was designed by N. O. Miller[2] to eliminate the use of the swab in flowing wells. This tool was adapted to use in tubing. It cuts out the paraffin which is then flowed up the casing and out into the stock tank, through the annular opening by the flow of oil and gas. By its careful use paraffin is removed as fast as it is cut. Gas-lift wells, flowing pipe line oil, show paraffin forming in the tubing, 1,500 to 2,000 feet off bottom to the surface, as in the flowing wells. Wells making water on the gas lift deposit paraffin from the bottom of the tubing to the surface. Gas-lift wells flowing high percentage of water show no paraffin formation. One of the gas lift wells flowing 80 per cent water has been flowing two months without any noticeable paraffin formation.

Kerosene as Paraffin Solvent

Kerosene has been used as a solvent for paraffin, with some success in increasing production. The results given below are typical after lubricating from two to six drums of hot kerosene in wells which had shown rapid decline in production two to three days previously. The kerosene dissolved the paraffin obstructing the passage of oil, and the production regained, or surpassed, is normal value.

Kerosene has also been found useful in reducing operating pressures in gas-lift wells. Gas-lift wells will show a gradual increasing in operating pressure, which cannot be accounted for except by the accumulation of paraffin at and near the bottom of the tubing, both in the casing and in the tubing. The lubrication of a few drums of kerosene into wells of this type reduces operating pressures 10 to 40 pounds to its original value.

A method of combating paraffin, which has collected in the pay formation, is to allow the well to stand for a few days. If the well is not gassing, the face of the well bore is warmed by conduction from the formation adjacent to the well to temperatures approaching the original subsurface temperatures, and the warm oil is given an opportunity to soften and dissolve the paraffin. This has been tried and has given excellent results. A well on the gast lift which had decreased in production was shut in for four days. The average production for two weeks before shut down, was 45 bbls. After the shutdown the production increased to a 130-bbl. average.

Pumping wells cause much trouble because of the separation of paraffin in the pump and in the tubing. Valves stick, friction is increased and pump action becomes jerky and erratic. This has caused much rod breakage, and the pulling of tubing and pump to steam the paraffin out. Some of these difficulties have been overcome by lubrication of kerosene into the well and by the introduction of steam, either through the casinghead, or by means of a string of small tubing 100 to 1,000 feet long.

Use of Wire Line Pumps

Increased mechanical efficiency and increased production have resulted by the use of wire line pumps. The whip in the wire line keeps the paraffin from collecting in large amounts in the tubing. Breakage of the wire line is less than the previous breakage of rods. Wire line breakage was severe when the wire line pumps were first used. The field men noted that the breakage occurred at the wire rope socket connecting the wire rope to the short length of sucker rod between the pump and line. A study of this was made and the conclusion reached that the breakage occurred because the wire line was falling faster than the pump barrel, and the resulting bend broke the line. Three hundred feet of sucker rod are now attached to the top of the pump and the added weight and rigidity has partially eliminated this trouble. This defect has been further eliminated by slowing down the pumping stroke to 18 s.p.m. and pumping in the fourth hole to offset the decrease in pump capacity due to slower motion. This slower motion allows the pump to drop at a rate comparable to the pumping motion. Production has increased 10 to 30 bbls. on each well where this has been tried. Increased production is also due to the installation of electrical motors, with the resulting evenness of operation. The wire line pump, however, is still causing a lot of trouble, due to breaking of the line, and to wire line wickers cutting cups and valves. These disadvantages are difficult to overcome, but once they are surmounted, the wire line pump will be superior to the present pumping equipment.

Flow lines are all equipped with heaters made by welding two or more joints of larger pipe on the flow line and providing for an inlet and an outlet for steam. Some flow lines are equipped with steam jets welded into the flow line near the well. The periodic injection of steam cleans the paraffin out of the flow line.

Flow tanks, separators and stock tanks are all equipped with steam coils. The oil is kept above the congealing point and the paraffin remains in solution.

Experimental Heating of Panhandle Crude

Samples of Panhandle crude were heated for varying periods of time in closed vessels in a temperature-regulated electric oven. After a definite period of time, as indicated in the tables following, a vessel was removed from the oven. A sample was taken and the vessel of heated crude stored at another temperature. A cold test was then taken on this first sample, which represented the state of the crude immediately after heating. At the stated periods of time, thereafter, another sample was removed and the cold test taken. A few viscosities were also taken and measured on two of the heated samples. These viscosities were taken at 100 degrees Fahrenheit and any effect on viscosity was probably lost, due to the heating to this higher temperature. A sufficient amount of crude was heated to provide a number of samples for the measurements taken, without mixing these samples after testing with the original batch. The results obtained are summarized in Tables 3 to 6.

Discussion of Results

The results tabulated in Table 3 clearly

TABLE 2—EFFECT OF KEROSENE WASH ON PRODUCTION

Well No.	Method of Production	Average Daily Production for a Week Before Lubrication	After Lubrication	Daily Increase
1	Gas lift	90	97	7
2	Pump	60	88	28
3	Gas lift	130	145	15
4	Pump	30	60	30

TABLE 3—COLD TEST HYSTERESIS OF PANHANDLE CRUDE

(Eight-well composite, 36.6 degrees A.P.I.)

Heated Temp. Deg. F.	Original Cold Tes. Deg. F.	Storage Temp. Deg. F.	Cold Tests (Deg. F.) Found After Storing for Time Indicated 0 Hr.	24 Hr.	48 Hr.	72 Hr.	96 Hr.
150	60	150	0	0	0	0	2
150	60	82	0	0	44	62	66
150	60	40	0	20	24	42	50
82	60	82	60	66	65	66	66
82	60	40	60	64	64	64	64

TABLE 4—COLD TEST HYSTERESIS OF PANHANDLE CRUDE

(Eight-well composite, 36.6 degrees A.P.I., original cold test of 60 degrees Fahrenheit.)

Oven Temperature Deg. F.	Time in Oven Hr.	Storage Temperature Deg. F.	Cold Tests Found After Storage for Time Indicated 0 Hr.	24 Hr.	48 Hr.	72 Hr.
115	2	40	0	23	16	34
115	4	40	0	0	16	18
115	12	40	2	18	22	36
115	24	40	0	28	38	48

TABLE 5—COLD TEST HYSTERESIS OF PANHANDLE CRUDE

(Eight-well composite, 36.6 degrees A.P.I., original cold test of 60 degrees Fahrenheit.)

Oven Temperature Deg. F.	Time in Oven Hr.	Storage Temperature Deg. F.	Cold Tests Found Af.er Storing for Time Indicated 0 Hr.	24 Hr.	48 Hr.	72 Hr.
115	3	40	0	24	31	36
115	6	40	5	38	40	44
115	12	40	0	36	46	48
115	24	40	0	34	35	37

*A contribution from research department of Marland Refining Co. of Oklahoma and production engineering departmen. of Marland O.l Co. of Texas. Read before midyear meeting, petroleum division, A.I.M.E., Fort Worth, Tex. Copyright, 1927, by the American Institute of Mining and Metallurgical Engineers, Inc.

[1]Smith (U.S.B.M. Circular No. 6014, "Analysis of Panhandle and Big Lake Crudes," December, 1926) found an average sulphur content of 0.6 per cent.

[2]For a full description of this tool and a discussion of its use, see "Some New Aspects of the Gas Lift," by E. O. Bennett and K. C. Sclater, Petroleum Development and Technology in 1926. A.I.M.E. Pamphlet No. 1667-G. See also C. E. Reistle, Jr., "Removing Paraffin From Wells," The Oil and Gas Journal, May 12, 1927.

Announcing

D+B SIMPLEX INSERT PUMP

This new D+B Pump adds to the famous D+B line a perfect *insert* pump which possesses all the desirable features of the "pull-out" type of pump plus the usual D+B *highest* standard of materials and construction.

The SIMPLEX goes in and out of the well on the rods, eliminates tubing jobs, and minimizes shock and strain on the rods. It is particularly adapted to deep well pumping, and, because the oil is kept in motion, sand has no opportunity to settle. Its design eliminates "gas locks" and renders churning of the oil impossible, greatly reducing emulsification. Reduces costs. Brings up production. Investigate.

"If CONTINENTAL Sells It, There Is No Better."

THE CONTINENTAL SUPPLY COMPANY

General Offices: St. Louis

Export Office: 74 Trinity Court, New York City

London Office: 316-317 Dashwood House, Old Broad St., E. C. 2.

THE CONTINENTAL SUPPLY COMPANY, Limited
69 Thomas Block, Calgary, Alberta, Canada

CONTINENTAL

demonstrate the effect of heating Panhandle crude. The original crude showed a cold test of 60 degrees Fahrenheit. The average room temperature during these experiments was 82 degrees Fahrenheit. Four bottles were filled with the crude and these were treated as indicated in Table 3. The bottles containing crude at 82 degrees Fahrenheit showed little change on standing at 82 degrees Fahrenheit and at 40 degrees Fahrenheit. Heating to 150 degrees Fahrenheit demonstrates the fact that the cold test of hot crude is kept at ± 0 degrees Fahrenheit. This lowered cold test gradually regains its original value upon being kept at the lower temperatures of 40 and 82 degrees Fahrenheit.

The results tabulated in Tables 4, 5, 7 and 8 show the same hysteresis of Panhandle crude upon heating to 110 and 115 degrees Fahrenheit. There is also an effect due to the temperature at which the heated samples were stored and the length of time the samples were allowed to remain in the oven. The higher storage temperatures and the longer times of heating result in more rapid return of the oil to its original cold test. The cause is probably the same in each case. Any action, whether chemical or physical, proceeds at a faster rate the higher the temperature. Storing at a higher temperature restores the crude more quickly to its original condition. The effect of time of heating is undoubtedly due to the higher temperature attained by the crude on standing in the oven a longer period, and is due to the fact it was not heated to the higher temperature quickly. This increased heat content requires a longer period of time to dissipate, and, in effect, the temperature is maintained at a higher value during the initial period of cooling.

The effect of the added chemical is shown to be an acceleration of the return of the crude so treated to its original cold test.

This study of the cold test and viscosity characteristics was undertaken in the hope that it would yield information which would indicate the most satisfactory method of handling Panhandle crude during the winter months. The normal temperature drops below 60 degrees Fahrenheit during September, reaches a minimum of 34 degrees Fahrenheit in January and does not rise above 60 degrees Fahrenheit until April. Soil temperatures 3 feet below the surface may be taken as the normal air temperature. Operations must be carried on for six months during which time the air temperature is below the cold test temperature of the crude.

Pipe Line Operation

The low air and soil temperatures during the winter months forced the Panhandle operators to heat their oil in flow and stock tanks to keep it from congealing and to facilitate treating. The results of the experiments on Panhandle crude prove definitely that, after heating the crude to 115 degrees Fahrenheit, the cold

(Continued on Page 137)

TABLE 6—VISCOSITY HYSTERESIS OF PANHANDLE CRUDE

(Eight-well composite, 36.6 degrees A.P.I., 170 sec. Saybolt at 100 degrees Fahrenheit.)

Oven Temperature Degrees F.	Storage Temperature Degrees F.	Average Saybolt Viscosities at 100° F. Found After Storing for Time Indicated 0 Hr.	24 Hr.	48 Hr.	72 Hr.
115	40	146	119	133	137
115	40	123	115	118	125

A sample of crude was heated in contact with fuller's earth, and another in contact with freshly burned lime. The crudes were then filtered and cold tests were taken as before. These results are summarized in Table 7.

TABLE 7—COLD TEST HYSTERESIS OF PANHANDLE CRUDE AFTER HEATING WITH FULLER'S EARTH AND WITH LIME

(Burnett crude, original cold test 70 degrees Fahrenheit.)

Temperature Heated Degrees F.	Heated With	Cold Tests After Storing at 85° F. for Time Indicated 48 Hr.	60 Hr.	84 Hr.
150	Fuller's earth	34	55	66
150	Fresh lime	20	50	67

Various producers in the Panhandle Field were, at one time, approached by salesmen selling compounds which it was claimed would reduce the cold test of the crude. Two samples of one of these compounds were obtained and were analyzed. The analysis gave the following:

Sample No.	Na O H Per Cent	Na_2CO_3 Per Cent	Na H Co_3 Per Cent	Cr. Napthalene Per Cent
1	21.8	5.3	..	72.9
2	....	25.0	2	73.0

The chemical was probably a mixture of sodium hydroxide and naphthalene when originally mixed and absorbed carbon dioxide from the air. Cold test experiments were performed with samples Nos. 1 and 2 and these experiments are summarized in Table 8.

TABLE 8—COLD TEST HYSTERESIS OF PANHANDLE CRUDE WITH ADDED CHEMICAL

(Burnett crude, original cold test of 70 degrees Fahrenheit, stored at room temperature, 85 degrees Fahrenheit.)

Temperature Heated Degrees F.	Chemical Lbs. per Barrel	Cold Tests Found After Storing for Time Indicated 0 Hr.	12 Hr.	24 Hr.	48 Hr.
Series 1 with Sample No. 1					
110	0—check	0	28	35	57
110	1.6	0	15	17	53
110	5.9	0	28	35	54
110	9.7	0	50	45	58
Series 2 with Sample No. 2					
110	0— check	0	28	25	57
110	2.3	0	36	39	54
110	5.05	0	43	40	57
110	7.3	0	44	45	56

TABLE 9—TEMPERATURE DROP IN AN 8-INCH HEATED OIL LINE

K=1. Soil Temperature=32 Degrees Fahrenheit. Initial Oil Temperature, 115 Degrees Fahrenheit.)

Rate of Flow Bbls. per Day	Distance, Miles	Final Oil Temp., Degrees F.	Time of Flow Hours	Probable Cold Test
10,000	15	37	11.7	Below 32° F.
	11	42	8.6	Below 25° F.
	7.5	56	5.98	Below 20° F.
20,000	15	51.5	5.9	Below 20° F.
	11	60.5	4.3	Below 20° F.
	7.5	74.5	2.99	Below 5° F.
30,000	15	61.8	3.92	Below 15° F.
	11	66.6	2.87	Below 5° F.
	7.5	85.2	1.96	Below 0° F.

Some actual temperatures taken on an 8-inch heated oil line are given in Table 10.

TABLE 10. FIELD DATA; 8-INCH BURIED HOT OIL LINE

(Date Taken November 30, 1926. Normal Temperature, 50 Degrees Fahrenheit. Initial Oil Temperature, 120 Degrees Fahrenheit.)

Time and Air Temperature	Distance from Heater and Soil Type	Depth of Reading Inches	Distance From Line Feet	Temperature of Soil Degrees F.
12:00 P. M.	11 miles	30 (on line)	0	92
72 Deg. F.	tight	34	1	79.7
	black	34	2	71.3
	clay	34	20	53.5
2:30 P. M.	5.5 miles	24 (on line)	0	92.2
82 Deg. F.	sandy	30	1	78
	soil	30	2	71.5
		30	20	55.5
4:30 P. M.	200 feet	32	0	101.5
78 Deg. F.	sandy	36	1	78.5
	soil	36	2	69.7
		36	20	56.5

TABLE 11. REDUCTION OF HEATING ON CLOSER SPACING OF HEATING STATIONS.

(20,000 Bbls. Day. K=1. Incoming Temperature=70 Degrees Fahrenheit. Final Temperature Desired=60 Degrees Fahrenheit. Average Panhandle Crude.)

Distance Miles	Required Initial Temp. Deg. F.	Millions B.t.u. Required—Each Sta.	15 Mi. Equiv.	Saving in B.t.u. Percentage Over 15 Mi.
15	144	232.	232.	0.
11	109	122.4	166.9	27.1
7.5	88	56.55	113.1	51.2

Air-Gas Lift and Ultimate Output

Relation to Gas-Oil Ratios Considered in the Light of Data From California. Individual Wells Cited

By F. W. Lake*
Brea, California.

The ultimate production from a natural reservoir is inversely proportional to the gas-oil ratios existing during the producing life of the reservoir, in all accumulations of petroleum where, and during the period that, gas is the major expulsive force in the recovery. In other words, in the period during which gas is the major expulsive force the ultimate production will be increased if the gas-oil ratio is decreased and vice versa. This condition controls in most of the producing districts.

While this relation is difficult to prove from actual operation, because of the paucity of detailed observations, it must be admitted after a study of the forces and conditions governing the recovery of petroleum from natural reservoirs. Where gas and oil exist under pressure in sand interstices and water movement is not freely possible, the force expended in moving the oil to the well is the expansion and movement of the gas through the pressure differential existing between the interior of the reservoir and the well. If, in the untapped reservoir, pressure and solution conditions are such that the relation between gas and oil volumes at atmospheric conditions is 100 to 1; and if during the producing period until the gas is exhausted, the relation between the gas and oil volumes produced is 300 to 1; then only one-third of the oil has been produced and the remaining two-thirds cannot be recovered unless some extraneous force is introduced into the reservoir. This serves to illustrate the importance of gas-oil ratio control during normal producing operations.

Gas-Oil Ratio Controls

Eliminating natural conditions in a reservoir which govern gas-oil ratios, such as the physical properties of the oil and gas, the physical characteristics of the reservoir strata and the original pressure and solution conditions in the reservoir, which cannot be controlled by operation practice; and also eliminating operating conditions which apply to the reservoir as a whole, such as well spacing, well locations, relative completion dates, various penetrations and drilling practice; there remains but one condition in each well which influences the gas-oil ratio and which is subject to control by operation practice, namely, the effective back-pressure existing in the well opposite each of the producing strata. For each well at a certain time in its life there is an effective back-pressure which will give the minimum gas-oil ratio, but this effective back-pressure may or may not be within the limits determined by the various mechanical and economical conditions of actual practice.

The minimum gas-oil ratio varies widely in different wells, in different areas, in different periods during its productive life. The minimum gas-oil ratio obtainable may vary from as low as a few cubic feet per barrel to as high as several thousand cubic feet per barrel and in each case be a minimum for a certain well at a certain time.

Regulating Back Pressure

Since for each well, gas-oil ratio control lies in the effective back-pressure opposite each of the strata contributing to production, the various methods of production are more or less flexible in furnishing means for changing the effective back-pressure to obtain the minimum gas-oil ratio. In flowing wells it is usually difficult to change tubing diameters and depths and hence two factors remain for the adjustment of the effective back-pressure: (1) the regulation of back-pressure at the tubing head by beans, flow nipples or trap pressure, and (2) the introduction of various amounts of gas in the casinghead similar to gas-lift practice. In pumping wells, the pumping depth, rate of pumping and the pressure held on the casinghead furnish means for the variation of the effective back pressure to obtain a minimum gas-oil ratio. In gas-lift wells, however, more conditions are introduced which may be varied to obtain the effective back-pressure resulting in the minimum gas-oil ratio than in any other method of production. It is due to this characteristic of gas-lift operation that lower gas-oil ratios can usually be obtained, because the limits of effective back-pressure variation, which are controlled by the mechanical conditions of actual practice, are considerably extended.

In gas-lift operation there are four convenient means for the control of the effective back-pressure. Adjustments in tubing diameters, tubing depths, gas volumes circulated and tubing head pressures will permit considerable variation in the effective back-pressure. This pressure cycle can be varied within certain limits to increase or decrease the effective back-pressure on the first oil sand at the same time either decrease or increase the effective back-pressure on the second oil sand by adjustments in tubing diameter, depth, gas volume circulated and tubing head pressure. Thus the flexibility of effective back-pressure control in gas-lift operation is largely responsible for the means of obtaining lower gas-oil ratios than possible under other methods of operation. The following production curves are illustrations of gas-oil ratios obtainable with gas-lift operation in southern California wells.

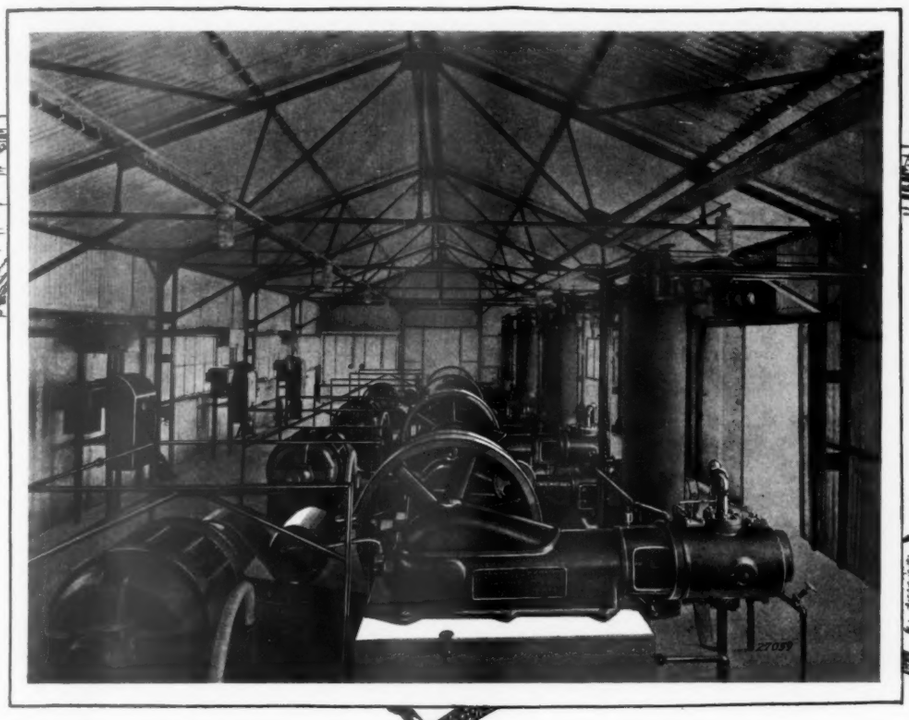
Brooks Well No. 2

In the beginning of 1925, this well was on the pump, producing between 180 and 200 bbls. per day. The production was declining while the gas-oil ratio was increasing more rapidly each month. In June, 1925, a two-weeks' test was made on the gas lift. The production was substantially increased and the gas-oil ratio decreased. After two weeks the well was put back on the pump up to September 1, 1925. The pumping production during this time, while less than that obtained during the gas-lift test, was considerably more than the earlier pumping record and the gas-oil ratio, while higher than the gas-lift ratio, was lower than the former pumping ratio but was again increasing each month. When put back on the gas lift permanently in September, 1925, the gas-oil ratio increased with the increase in oil production but remained lower than during the first pumping period. Up to June, 1926, the well was being flowed through 2½-inch tubing at a depth of 3,800 feet. On June 1, 1926, the tubing was pulled and the well was flowed through the 6¼-inch oil string with the top of the perforations at 3,470 feet, the gas being introduced between the 6¼ and the 8¾ inch. With this change, the oil

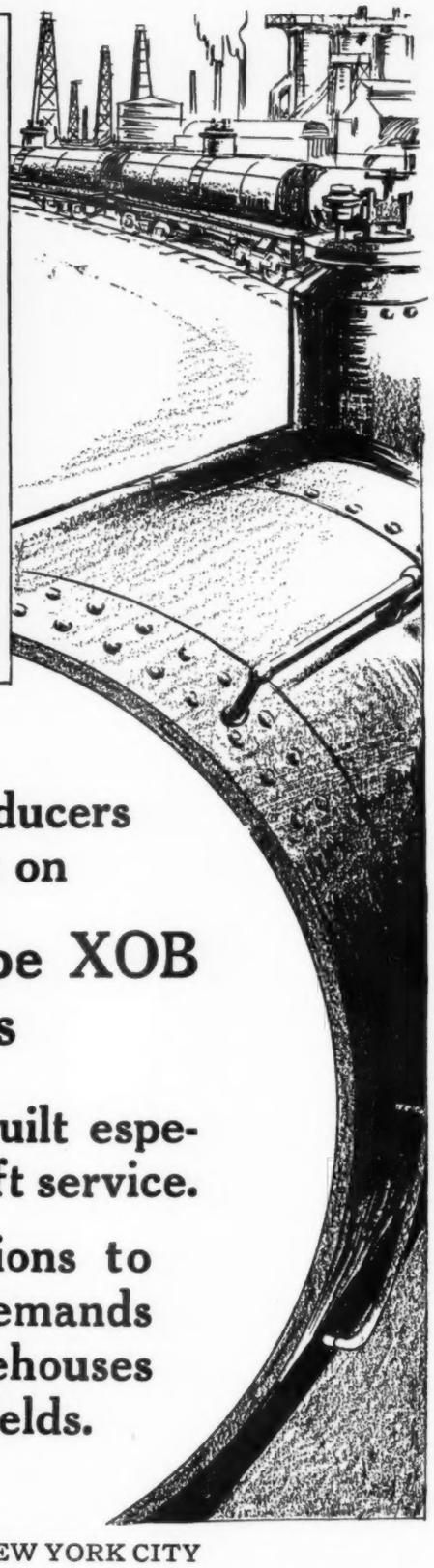
(Continued on Page 133)

*Before midyear meeting of the Petroleum Division, A. I. M. E., Fort Worth, Tex.

Copyright, 1927, by the American Institute of Mining and Metallurgical Engineers, Inc.



Four 10x4½x10 Type XOB-2 Compressors in a plant of the Kingwood Oil & Gas Company.



Ingersoll-Rand Offices in the Oil Fields.

Butte
Birmingham
Dallas
Denver
El Paso
Los Angeles
New Orleans
Salt Lake City
San Francisco
Seattle
St. Louis
Tulsa

Many of the Oil Producers are standardizing on

Ingersoll-Rand Type XOB Compressors

These machines are built especially for air and gas lift service.

Cylinder combinations to meet any pressure demands are stocked in warehouses throughout the oil fields.

INGERSOLL-RAND COMPANY—11 BROADWAY, NEW YORK CITY

Offices in principal cities the world over.

FOR CANADA REFER—CANADIAN INGERSOLL-RAND CO., LIMITED, 10 PHILLIPS SQUARE, MONTREAL, QUEBEC

888-C

Ingersoll-Rand

Handling Congealing Oil and Paraffin

Summary of Existing Information on Important Subject. Problems in Producing Oils of High Paraffin Content

By C. E. Reistle, Jr.*
Laramie, Wyoming

All crude oils become more viscous when chilled, but the only oils that congeal and precipitate paraffin to such an extent as actually to cause production troubles are those that contain an appreciable amount of wax.

In handling these oils of high wax content, three distinct problems may be encountered before the oil reaches the refinery. The first problem is the precipitation and accumulation of paraffin in the well, either in the oil string or on the face and in the pores of the sand. The second problem is the accumulation of paraffin and the congealing of oil in the transportation lines. The third problem is the precipitation of paraffin and the formation of tank bottoms.

Solubility of Paraffin in Crude Oil

Two main factors, possibly three, govern the solubility of wax in crude oil. The first of these is temperature. The solubility of wax in crude oil increases with an increase in temperature, and as the temperature approaches the melting point, the wax becomes soluble in all proportions in the crude oil. The higher the melting point of a wax, the less soluble it is in crude oil below its melting point.

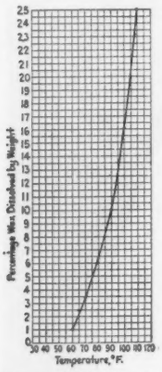


Fig. 1. Solubility of crude paraffin wax in crude oil at 36.2° A.P.I. from the Panhandle Field, Texas.

All crude oils containing wax can be chilled to a point where the oil is saturated with wax. If the temperature is decreased below this point, some of the wax will crystallize from solution. Figure 1 shows the effect of temperature on the solubility of crude paraffin in oil.

The second factor is the amount of volatile constituents and gas removed from the crude oil. Evaporation of the volatile constituents and gas lessens the volume of the oil and concentrates the solution of wax in the oil; therefore less wax can be held in solutoin at a definite temperature. As the natural amount of wax present in the oil is constant, this results in the oil becoming saturated with wax at a higher temperature than if the volatile constituents and gas were still in the oil. As an example of this, a fresh sample of crude oil having a gravity of 39.8 degrees A.P.I. was saturated with wax at 72 degrees Fahrenheit. The temperature was held constant and the oil evaporated until it had a gravity of 37 degrees A.P.I. Approximately 1 per cent by weight of wax was precipitated from solution.

The possible third factor is the presence of water. Water is slightly soluble in crude oil; and it is probable that oil containing water is a poorer solvent for wax than dry alcohol or acetone. The exact effect of water on the solubility of wax in crude oil has never been determined. The writer is working on this particular phase of the problem.

Character of Congealed Oils

When crude oils that contain wax are chilled or evaporated sufficiently, some of the wax will be precipitated or crystallized from the solution. The size of the crystals depends to a slight extent on the rate of cooling. This is negligible, however, as even with slow cooling or evaporation the crystals remain small. If the crude oil is not agitated while this crystallization takes place, the crystals interlock and form a network which prevents movement and supports or holds the liquid constituents of the oil. If the oil is agitated during crystallization, the oil remains liquid, although its viscosity is greatly increased by the presence of solid or semisolid wax crystals. This is similar to results obtained by adding fine colloidal clay to water; if sufficient clay is added the resulting mass will become viscous. If the temperature is lowered sufficiently, the oil will congeal, even though agitation is continued. this is due to the large number of wax crystals present and also to the fact that the liquid constituents become so viscous that internal friction prevents any free movement of oil around the wax.

These small wax crystals have a tendency to accumulate into small granular particles, each particle being composed of a number of the wax crystals. This is found especially in storage tanks where the oil stands over a long period of time. The formation of granular particles will usually take place more rapidly when the oil is cooled only slightly below the point of saturation, as the wax crystals then have more freedom to move and settle out of the oil. When the oil is cooled until it has congealed, the wax crystals cannot move to form these granular particles. If congealed oil is agitated, the crystals come into contact with one another and often form these larger particles.

Waxes will remain in solution in crude oil and will form supersaturated solutions, even though the oil has been chilled to a point below where it is saturated with wax, but the wax will slowly crystallize from solution until equilibrium is established and the oil is saturated with wax at that respective temperature.

If crude oil that contains a large amount of wax is heated to a temperature above the highest melting point of the wax, another set of conditions is created. The wax then becomes a liquid dissolved in a liquid, each liquid being soluble in the other; instead of a solid dissolved in a liquid, the liquid being insoluble to any great extent in the solid. The latter case is where the wax has been dissolved in the oil at a temperature below its melting point.

If, after heating the oil to a temperature above the melting point of the wax, the oil is again cooled below the temperature at which it is saturated with wax, no crystals form. This is probably due to the fact that the wax formed a solution of the oil in wax, and this solution of oil in wax is soluble in the oil below the temperature at which the wax would ordinarily separate out of solution if it were present as a solution of wax in oil instead of oil in wax. If the temperature is maintained below the melting point of the wax and also below that point where it is completely soluble as wax in oil, the solution of oil in wax will slowly change over to wax dissolved in oil; and as this continues there becomes an excess of wax dissolved in the oil, and some wax crystallizes out. This is the writer's explanation for the results obtained by heating high cold-test oils such as the Panhandle crude, and thereby reducing the cold test from a number of hours to several days. After standing for several days these crude oils regain their original cold test; this occurs when the oil dissolved in wax has been reconverted to wax dissolved in oil.

The paraffin that is deposited in producing wells varies in consistency from a soft, granular semifluid, containing considerable oil, to a hard semisolid wax, containing only a small quantity of oil. Usually some sand, water and inorganic silt is also present. The character of the paraffin depends primarily on the amount of oil present with the wax. This in turn is usually governed by the length of time the wax has been allowed to accumulate in the well. On standing in the well, the oil slowly drains and works out of the wax deposit, leaving it in a more compact and drier state.

The character of the paraffin is affected also by the amount of cooling and evaporation to which the oil is subjected in the well. If there is only sufficient cooling and evaporation to cause the precipitation of a small amount of wax, the melting point will be high, as waxes with the highest melting points will be the first to crystallize from the solution. If a greater cooling and evaporation takes place, a greater quantity of wax will separate from solution, but the melting point will be slightly lower because waxes of low melting point crystallize from solution, in addition to those of higher melting points. The melting points of paraffin from wells in different fields are given in Table 1.

TABLE 1—MELTING POINTS OF CRUDE PARAFFINS

Field, Sand—	Melting Point, Degrees Fahrenheit
Salt Creek, Wyo., 2nd Wall Creek	165.4
Lance Creek, Wyo., Dakota	181.0
Panhandle, Tex., Granite Wash	141.2
Marietta, Ohio, Macksburg Stray	135.2
Clay District, W. Va., Big Indian	161.9
Bradford, Pa., 3d Sand	132.1

These crude waxes consist of a number of fractions having different melting points. Usually the wax with the lowest melting point melts at about 135 degrees Fahrenheit, and fractions regularly increase in melting point to as high as 191 degrees Fahrenheit. In the Panhandle, wax fractions with the lowest melting point found melted at 141 degrees Fahrenheit, while those with the highest found melted at 172 degrees Fahrenheit. In Lance Creek, waxes melting at from 135 degrees Fahrenheit to 191 degrees Fahrenheit were found.

Deposition of Paraffin in Flowing Wells

The accumulation of paraffin in the oil string of flowing wells forms constrictions in the pipe and retards the flow of oil. If the paraffin is not removed it will gradually fill the pipe and kill the well. As the quantity of paraffin increases, the production of the well gradually declines; it is essential, therefore, to remove or prevent it in order to obtain the maximum amount of oil available.

The paraffin deposits in flowing wells usually extend from the top of the well to a depth of several hundred feet. As a general rule, this lower limit of paraffin accumulation corresponds roughly with the depth at which the earth temperature is the same as the temperature at which the oil is saturated with paraffin, or to the fluid level in wells where the oil rises above this point. Where a large amount of gas is produced, and where excessive cooling takes place, the paraffin often extends somewhat deeper.

In new fields, the oil leaves the sand at a temperature above that at which it is saturated with paraffin. However, as the oil is expelled from the well, it is cooled by the gas that is doing work in lifting the oil. by radiation of heat to the surrounding formations, and also because some of the lighter constituents are evaporated by the gas, which also produces cooling. In many cases, this results in the crystallization of wax from solution in the oil. However, the presence of free paraffin in suspension in the oil is not sufficient to cause any great amount of paraffin to accumulate in the well. It is essential, in addition to this, to have a set of conditions whereby these suspended particles of wax have an opportunity to settle out of the oil and become attached to the walls of the oil string; otherwise, they will be carried out of the well by the oil.

Accumulation of Paraffin

The most favorable condition for the accumulation of paraffin takes place between flows. During this period the oil drains back into the well, leaving a thin film of oil and suspended wax on the sides of the pipe; the oil drains away from these particles of wax, and they become firmly attached to the pipe. Additional paraffin may be precipitated from the oil film if the walls of the pipe are below the saturation temperature of the oil, especially if there is much gas being produced between flows, as this will have a tendency to remove an additional amount of the lighter contituents and raise the temperature at which the oil is saturated with wax. When the temperature of the surrounding strata is above that at which the oil is saturated with wax, the film of oil has a tendency to redissolve any suspended paraffin, and therefore very little accumulates. Sometimes when large quantities of gas are being produced during the period between flows, the film of oil may be evaporated to such an extent that it becomes saturated with wax at a much higher temperature than the bulk of the oil; in such cases the paraffin deposit will often extend below the point where the temperature of the surrounding strata is the same as that at which the main body of oil is saturated.

The amount of paraffin that accumulates in the well is governed to a large extent by the length of time elapsing between flows and the efficiency with which the oil is lifted. In wells having oil strings of the same size, there is usually a more pronounced cooling in the smaller wells, on account of the inefficient lifting of the oil and a better radiation of heat to the surrounding strata. During the periods when oil and gas are accumulating, there is a constant lifting and dropping of the oil in the well. This work on the oil by the gas lowers its temperature and also removes some of the lighter constituents. As a result of these conditions, the oil in smaller wells usually contains a larger amount of suspended paraffin. Table 2 gives an example.

Excessive Cooling

In addition to greater cooling, and therefore more suspended paraffin present in the oil, there is also a better opportunity for the suspended paraffin to become attached to the walls of the pipe in these wells. The longer periods between flows allow the oil to drain more completely from the pipe in the upper part of the well; and the suspended paraffin becomes more firmly attached to the pipe, so that less of it is removed by the oil when it flows from the well. In the wells under observation at Salt

(Continued on Page 182)

TABLE 2—TEMPERATURE DATA ON FLOWING WELLS AT SALT CREEK

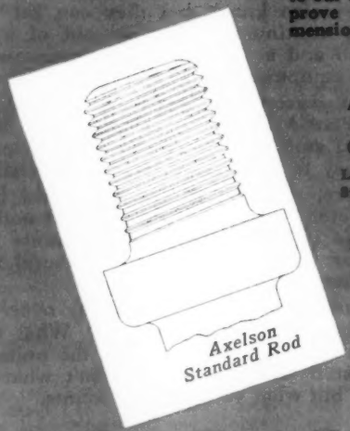
Well	Size of Oil String	Approximate Temperature of Sand Degrees F.	Temperature of Oil at Casinghead Degrees F.	Daily Prod. Bbls.	Cu. Ft. of Gas per Bbl. of Oil
8A NW¼ 13-40-79	2-inch Tubing and Packer	108	56	40	7,789
16A SW¼ 13-40-79	2-inch Tubing and Packer	108	66	243	2,848
31A SW¼ 30-40-79	2-inch Tubing and Packer	108	81	575	1,089

*Associate engineer, United States Bureau of Mines presented by permission of the Director of the Bureau at midyear meeting of Petroleum Division, A. I. M. E., Fort Worth, Tex., October, 1927. (Copyright, 1927, by the American Institute of Mining and Metallurgical Engineers, Inc.)

Octo

Axelson Announces A.P.I. Specification Sucker Rods

With the formal issuance of the official specifications for Sucker Rods by the American Petroleum Institute, Axelson is now placing these Rods on production. The master gauges for checking A.P.I. Rods will not be available from the gauge makers for approximately sixty days, but in the meanwhile the Rods we manufacture will be A.P.I. Specifications according to our interpretation and should prove identical to official dimensions.

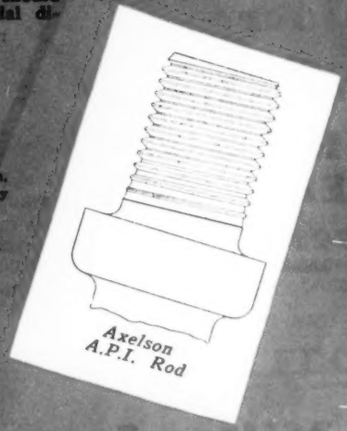


AXELSON MACHINE COMPANY

Los Angeles, Tulsa, St. Louis, New York City

Mid-Continent Distributors:
Frick-Reid Supply Co.

Eastern Distributors:
Frick & Lindsay Co.



AXELSON SUCKER RODS

Steady Continuous Operation

is the Performance Record that Proves the mettle of

WATTS GAS ENGINES AND COMPRESSORS MILLER

for 24 HOUR SERVICE Every Day

Long-headed buyers know that it isn't what you pay, but what you get, that counts.

Being far-sighted they realize that steady, continuous operation and maximum production are far more important than any small saving on the initial cost of the plant.

What's more, they also know that they can get maximum steady continuous operation out of a Watts-Miller job and at the same time maintain and service the equipment with minimum expense.

Those are the reasons why seasoned field men swear by Watts-Miller. They know just how powerful and smooth in operation—how dependable and easy to service—Watts-Miller really is.

Furthermore, the very fact that shrewd buyers have ferreted out the facts and found nothing to equal this make of equipment accounts for this particular make being in more general use than any other. Significant, Isn't it?

Watts-Miller engineers never overrate the capacity of their product. What the contract they write specifies, the units they install will develop. It isn't what you buy, but what you get, that counts.

The Miller Improved Gas Engine Co.

Springfield, Ohio

Tulsa, Okla., Office
323 No. Cheyenne Ave.

Los Angeles Office
529 Western Mutual Life Building

AIR-GAS LIFT PRACTICE IN SEMINOLE FIELD

(Continued from Page 80)

lift all of the oil possible to lift economically. This combined operation is probably the method toward which we shall eventually be working in recovering the maximum quantity of oil from pools where the oil is recovered through bore holes.

TABLE 3—PRODUCTION IN VARIOUS POOLS OF THE SEMINOLE FIELD, JUNE, 1927

Company—	June 6 Total Bbls.	June 6 Air-Gas Lift	June 13 Total Bbls.	June 13 Air-Gas Lift	June 20 Total Bbls.	June 20 Air-Gas Lift	June 27 Total Bbls.	June 27 Air-Gas Lift
Bowiegs Pool								
Amerada Pet. Corp.	11,715	11,715	10,140	10,140	11,070	11,070	11,940	11,940
Atlantic Oil Prod. Co.	7,693	3,534	9,264	5,084	7,702	6,247	10,590	10,590
Barnsdall Oil Corp.	1,023	.....	267	.....	80	.....	643	.....
Carter Oil Co.	20,015	12,105	23,800	23,800	23,675	23,505	22,445	19,700
Empire Refineries, Inc.	7,223	7,223	6,274	6,274	5,580	5,484	6,741	4,001
Gypsy Oil Co.	4,117	3,835	4,364	4,064	4,770	4,532	4,674	4,584
Independent O. & G. Co.	.....	.....	.....	.....	1,215	1,215	1,350	1,350
I. T. I. Oil Co.	44,833	39,212	46,429	46,422	51,670	49,490	54,503	52,334
McCulloch Oil Co.	440	.....	.....	.....	.....	.....	1,202	1,202
Mid-Cont. O. & G. Co.	2,463	1,643	2,333	1,253	3,102	3,102	2,696	2,696
Minnehoma	977	.....	2,456	.....	2,867	2,108	2,678	2,678
Prairie O. & G. Co.	9,215	8,990	9,020	7,279	9,425	9,425	9,460	9,460
Pure Oil Co.	12,057	11,873	14,370	14,141	17,840	17,289	26,823	26,823
Roxana Pet. Corp.	1,286	575	1,580	992	1,750	709	2,250	1,917
Shaffer Oil & Ref. Co.	.....	.....	.....	.....	.....	2,883	2,069	2,069
Sinclair O. & G. Co.	12,730	6,225	14,065	12,316	14,330	13,980	14,075	13,340
The Texas Company	4,745	1,145	5,730	2,330	1,925	1,925	5,771	5,771
Tidal Oil Co.	1,675	1,675	1,585	1,585	.....	.....	1,490	1,490
Total	142,206	109,750	151,677	134,679	157,001	152,965	181,400	171,945
Earlsboro Pool								
Amerada Pet. Corp.	12,108	535	11,284	509	10,487	1,640	9,742	1,247
Barnsdall Oil Corp.	7,265	1,043	7,042	847	13,088	1,043	10,474	561
Carter Oil Co.	.....	.....	.....	.....	.....	.....	6,095	.....
Crosbie	3,370	.....	3,280	.....	2,940	.....	2,715	.....
Empire Refineries, Inc.	.....	.....	.....	.....	10,500	.....	9,295	.....
Gypsy Oil Co.	8,446	1,931	10,388	9,649	7,608	7,593	9,418	5,731
Independent O. & G. Co.	2,350	.....	2,232	.....	1,942	.....	3,284	.....
Interocean	350	.....	210	.....	570	.....	512	.....
Magnolia Pet. Corp.	19,373	.....	22,549	.....	27,195	.....	23,905	.....
Mid-Cont. O. & G. Co.	3,995	580	3,540	.....	4,175	3,130	3,820	895
Phillips Pet. Co.	2,000	340	1,912	375	2,420	1,050	1,187	1,187
Phil-Mac	1,117	875	582	517	391	300	225	225
Prairie O. & G. Co.	245	245	275	275	4,150	155	10,915	.....
Sinclair O. & G. Co.	.....	.....	.....	.....	.....	.....	.....	.....
The Texas Company	445	.....	442	442	395	.....	325	.....
Total	61,054	5,549	63,736	12,614	85,859	14,911	91,912	9,846
Searight Pool								
Carter Oil Co.	16,815	2,974	16,985	4,915	16,190	2,500	14,759	2,340
Gypsy Oil Co.	672	765	615	672	535	535	530	530
Mid-Cont. O. & G. Co.	6,785	6,745	6,560	6,500	5,770	5,700	5,740	4,875
Prairie O. & G. Co.	5,215	5,020	5,480	5,400	5,035	4,965	3,535	3,420
Pure Oil Co.	854	.....	858	.....	1,487	.....	850	.....
Roxana Pet. Corp.	208	.....	4,368	.....	3,598	.....	3,372	.....
F. J. Searight	.....	.....	.....	.....	.....	.....	.....	.....
Sinclair O. & G. Co.	1,080	1,080	1,035	1,035	2,600	.....	2,600	.....
Twin State Oil Co.	975	975	1,040	.....	930	.....	1,217	.....
Wilcox O. & G. Co.	1,945	.....	3,525	1,650	2,385	1,600	2,536	2,536
Total	34,549	17,559	40,446	20,172	38,530	15,300	35,139	13,701
Seminole City Pool								
Amerada Pet. Corp.	4,011	3,541	4,020	3,547	3,937	3,689	3,386	3,367
Atlantic Oil Prod. Co.	410	.....	420	.....	960	.....	910	.....
Barnsdall Oil Corp.	8,069	7,024	6,977	6,732	6,072	5,677	6,037	5,907
Carter Oil Co.	37,032	20,965	37,427	15,807	32,535	16,385	29,383	16,458
Empire Refineries, Inc.	1,627	.....	3,508	3,218	3,434	3,127	3,102	2,875
Gypsy Oil Co.	6,987	6,208	5,570	4,981	7,383	4,987	7,215	4,684
Independent O. & G. Co.	2,559	1,613	2,820	2,742	2,159	2,159	2,484	1,883
I. T. I. Oil Co.	7,109	6,922	6,840	6,574	6,888	6,675	5,789	5,541
Kingwood	2,700	736	2,580	1,907	2,461	1,825	2,270	1,696
Magnolia Pet. Co.	1,902	598	1,572	1,572	2,012	800	1,364	1,364
Mid-Cont. O. & G. Co.	2,845	2,845	2,630	2,630	2,245	1,715	2,210	2,210
Mid-Kansas O. & G. Co.	860	860	749	749	769	738	833	755
Philmack	1,410	1,410	835	835	800	800	1,725	1,725
Phillips Pet. Co.	1,725	1,725	1,072	1,072	1,317	1,042	800	800
Prairie O. & G. Co.	4,112	3,587	4,155	2,155	3,901	3,130	3,907	3,242
Pure Oil Co.	9,849	9,849	8,968	8,938	8,167	7,960	7,763	7,440
Roxana Pet. Corp.	963	893	828	759	598	532	722	722
Sinclair O. & G. Co.	4,170	2,410	3,957	2,937	4,145	2,295	3,890	3,810
T. B. Slick	6,458	4,325	6,196	4,170	4,651	3,851	4,378	4,219
Superior Oil Corp.	2,127	.....	2,313	.....	2,318	.....	2,108	.....
The Texas Company	50	.....	30	.....	32	.....	21	.....
Tidal Oil Co.	8,010	7,650	7,987	7,567	7,463	5,033	8,735	8,365
Turman Oil Co.	7,489	641	4,983	4,983	4,461	1,411	3,887	2,774
Total	122,474	83,902	116,439	83,875	108,708	72,831	102,929	79,837

PARAFFIN TROUBLES IN EASTERN FIELDS

(Continued from Page 119)

quantity and used with water generates ample heat to melt paraffin.

Caustic soda (sodium hydroxide) and metallic aluminum on contact with water generate considerable heat. This combination was used quite extensively in the Eastern fields but it is a patented process and operators are reluctant to pay the premium. Also in general they have used too small a quantity for satisfactory results.

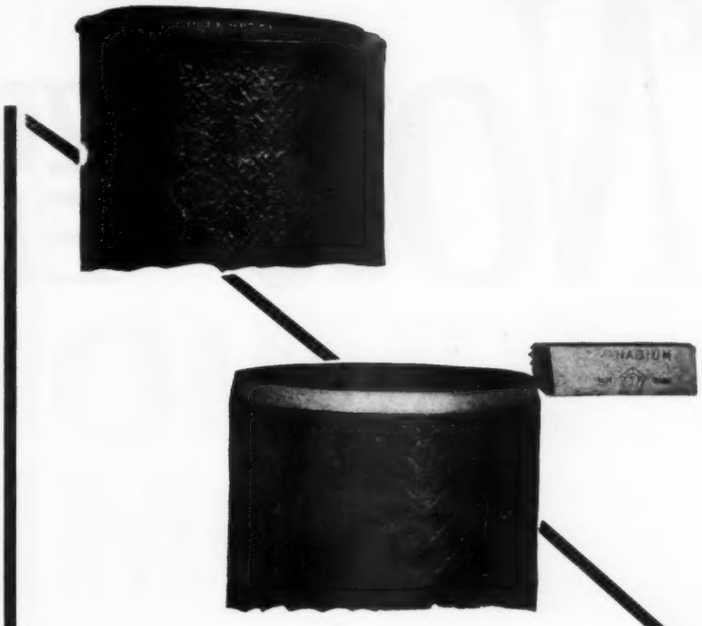
Sodium peroxide used in 100 to 200-pound quantities and dumped in wire cloth, tin, or glass containers into 1 or 2 bbls. of water generates intense heat and liberates oxygen to support combustion. Hydrogen and oxygen are generated through decomposition of water and they also burn. The paraffin is removed both by melting and burning. This process has not been used extensively but where used increases of 50 to 100 per cent in production were reported. However, this reagent on contact with water or dump objects immediately ignites and is dangerous to ship, handle, or use arounud inflammable structures. Hydrochloric acid when used to follow up sodium peroxide gives another violent reaction and generates intense heat. It also dissolves any calcium carbonate which may be found in the well. Calcium carbonate is just as objectionable as paraffin for plugging up and coating the pores in the sand and it is usually present in wells having a lime cap rock or lime interspersed with the sand. The fluid resulting from the hydrochloric acid reaction can be left in the well for several days without damage but where paraffin is prevalent it is advisable to bail while hot.

Sulphuric acid with caustic soda and water has been used quite extensively. It generates considerable heat and has been successful in removing paraffin. But it is dangerous to use in wells containing calcium or barium as it reacts with them to form insoluble sulphates commonly called "Gyp" which may plug the pores in the sand.

Gasoline, benzol and other solvents can be heated in the hole by using some of the above mentioned reagents and the success of both processes may be materially increased. But as mentioned before the fluid should be bailed or pumped out while hot.

Burning

A comparatively cheap and effective method of removing paraffin has been developed by the Hope Natural Gas Co. It is called the Garner-Leyden process (patented) and consists of maintaining a flame at the bottom of the well. A combustible mixture of air and gas are introduced through the tubing during the process of burning. This combustible mixture is ignited opposite the face of the sand by lowering a fuse down between the casing and tubing. Temperatures between 2,300 and 2,700 degrees Fahrenheit are maintained as long as desired.



Which Cut Do You Prefer?

It's a foolish question. There can be but one choice, but many are still cutting pipe as shown in the upper illustration.

If you would eliminate your pipe cutting problems on 2" to 4" pipe for all time, always have a smooth straight cut without burr with the edge neatly chamfered, to easily start the threading dies on the pipe, as shown in the lower illustration, then order from your dealer today a new—

"TOLEDO" No. 40 Automatic Pipe Cutter

This remarkable tool cuts rapidly, leaving a straight, square end cut without burr. It is compact, easy to handle and weighs but 65 pounds. Knives fed automatically. Very simple to operate. Net price but $60.00 f.o.b. Toledo. It is the pipe cutter you need for your work. Order one today from your supply house.

BUY BY COMPARISON AND YOU'LL BUY A

"TOLEDO"

THE TOLEDO PIPE THREADING MACHINE CO. TOLEDO, OHIO

New York Office, 72 Lafayette St.

Now A ZERO HOUR Electric 22-HOUR BOMB

This new Zero Hour Electric Bomb may be set to explode at any desired time from 12 to 22 hours after setting. It is for use where there is an extra long or difficult string of casing to be pulled—in cases where shot is placed late in the day and it is not desirable to have it put off before daylight the following day—or whenever the operator, for any reason, desires to have more than 12 hours elapse between the time bomb is set and the time he wants it to explode.

The construction of the Zero Hour 22-hour bomb is identical in every way with our standard 11-hour bomb, with the exception only of the watch used for timing. The new watch is of the same sturdy, reliable construction, but it is especially built so that the hour hand moves only once around the dial in 24 hours. The cost of the new 22-hour bomb is only slightly greater than that of our standard 11-hour bomb.

Like the Zero Hour standard 11-hour bomb, this new 22-hour bomb will NOT explode before the time for which it is set to explode. And it WILL put off the shot, functioning certainly and safely under any conditions of heat, pressure, magnetic influence or presence of cavings.

ZERO HOUR TORPEDO COMPANY
408 Cosden Bldg., Tulsa, Okla.
Day Phone 2-9612; Night Phones 3-1775, 3-7650, 2-6097

BORGER, TEXAS
Howard Culp
Phone 254, P. O. Box 411

SEMINOLE, OKLA.
George Pascoe
Phone 410, 518 Second St.

Zero Hour
Electric Bomb

The Zero Hour Electric Bomb can be secured through all principal torpedo companies. The advice of our engineering and shooting staff is yours for the asking.

This melts and burns the paraffin. The following examples are representative of results obtained by this process.

"Case A. Production in this well had declined to 6 bbls. per month in September, 1922. Heat treatment was used late in October and the well produced as follows: October, 1922, 14 bbls.; November, 17 bbls.; December, 19 bbls.; January, 1923, 18 bbls.; February, 11 bbls.; March, 15 bbls. A net gain of 64 bbls. in five months. Well is now making 11 bbls. per month. (January, 1925).

Case B. Before burning the well made 4 bbls. of oil per month. It was burned November 12, 1922, and a partial record is as follows: November, 1922, 2 bbls.; December, 5 bbls.; January, 1923, 12 bbls.; February, 7 bbls.; March, 7 bbls., making a net gain of 15 bbls. in five months. It is now producing 7 bbls. per month." (January, 1925).

Case C. This well had not so nearly reached the exhaustion stage as the ones previous cited. It had declined to 25 bbls. in October and 24 bbls. in November, 1922. Heat treatment was applied December 16, 1922. In December, 1922, the production was 77 bbls.; January, 1923, 60 bbls.; February, 67 bbls.; March, 42 bbls. This represents a net gain of 146 bbls. in four months. The well in October, 1925, was still producing 45 bbls. per month."

"Case D. This well averaged about 11 bbls. of oil per month to January, 1923. In January it produced 8 bbls.; February, 10 bbls. New rig had to be built and liner fished out. In March the well produced 17 bbls. of accumulated oil. In cleaning out oil was mudded and paraffined off entirely from March 30 to April 11. On April 11 the well was burned for 1 hour and 20 minutes. On April 12 the well was swabbed for 11 bbls., leaving about 10 bbls. of fluid in hole. It is now (January, 1925) producing 18 bbls. per month."

"Case E. At the middle of April, 1924, this well was producing at the rate of 50 bbls. per month. The 5⅞-inch was pulled to shoot, letting water on the oil and the well was shot with 50 quarts, mudding off the oil. Steam was used in the endeavor to bring the oil back, without results. The well was burned about June 1, the well showing for less than 1 bbl. per day at that time. It is now producing 100 bbls. per month." (January, 1925).

It can be seen from the above cases that paraffin in the pores on the face of the sand had caused a serious loss in production and Doctor Garner further states (letter August, 1927) that 50 per cent of their well trouble is due to paraffin. The Garner-Leyden process can be very cheaply applied in wells producing an excess of air on properties using the air recovery process. Oil soaked waste which has been ignited is dropped down the well and burning takes place on the face of the sand. It is usually allowed to burn for about 25 hours and then extinguished by pouring water down the hole. A similar method where compressed air is available is to pour about a barrel of gasoline down through the tubing and following by compressed air. Ignited oil soaked waste or a fuse is then dropped down the outside of the tubing. To extinguish this flame it is only necessary to shut off the air.

Pumping Wells

Wells pumping by heads are usually more pronounced in their paraffin troubles. In this case the oil is flushed from the tubing, leaving a thin film from which the paraffin settles out on the tubing and rods. This partially dries out and becomes firmly attached to the rods and tubing. Thus every flushing applies another coating and the accumulation of paraffin is relatively rapid. This same trouble occurs in wells pumping part time and where the equipment, valves or tubing leak.

When paraffin is permitted to dry out or partially dry out, it firmly attaches itself to any surface exposed and this paraffin is not redissolved or loosened when again flushed with oil. As long as the tubing or sand is full of oil the paraffin remains dissolved or is held in suspension, does not firmly attach itself to objects but settles very slowly to bottom.

Cleaning Tubing

The most practical and cheapest method of cleaning tubing or casing is by the use of the "paraffin hook"[5].

"The paraffin hook consists of a shaft on which is placed a disk of the same diameter as the inside diameter of the pipe to be cleaned. This disk is usually made from old belting and is reinforced by a metal disk slightly smaller in diameter. The shaft is so shaped that the disks are held in a diagonal position while being lowered into the casing or tubing but slips down into a horizontal position when pulled from the well thus scraping the paraffin off the casing or tubing in coming out. The shaft is made with a tool joint for casing and sucker rod joint for tubing. A sinker bar and jars are used for forcing it down the casing while a polished rod or sucker rods are used to force it down the tubing.

"This tool removes the paraffin from the well instead of merely cutting it from the pipe. This feature makes this tool valuable for use in wells where the paraffin has completely plugged the pipe or where the deposit is hard and extensive. In removing large deposits the tool should be run several times, taking only a part of the deposit each time in order to prevent overloading."

By using the paraffin hook whenever the rods are pulled it is possible to keep the tubing comparatively free of paraffin. It requires about two hours to thoroughly clean 500 feet of tubing. The use of a small winch on tractor or truck for pulling rods and running the hook or swab is very economical.

Conclusions

Present methods of removing paraffin from the face of the sand and out of the pores are not entirely satisfactory. The cost is very high and the beneficial results are usually short lived as generally within a few months production has declined to the same level proceeding cleaning. However, the Garner-Leyden process of burning is exceptional in that it has given an increase of production which has continued over a period of four years.

The use of chemicals as a whole is not satisfactory. The heat generated is not sufficient to cause an appreciable amount of paraffin to be melted and if larger quantities of chemicals are used the cost becomes prohibitive.

Solvents are better than chemicals for removing paraffin but to get satisfactory results it generally is necessary to heat and circulate the solvent for several hours. Also in deep wells and large shot holes the quantity of solvent necessary for satisfactory results makes the cost a considerable item.

In most cases the removal of paraffin by burning or hot solvents has been the more satisfactory. For cleaning tubing, casing, and pumping equipment, mechanical means is by far the better method.

[5]Reistle, Jr., C. E. Removing Paraffin from Flowing Wells. Bureau of Mines Serial 2,802, April, 1927.

COMPRESSOR'S SUCCESS IN THE OLD FIELDS

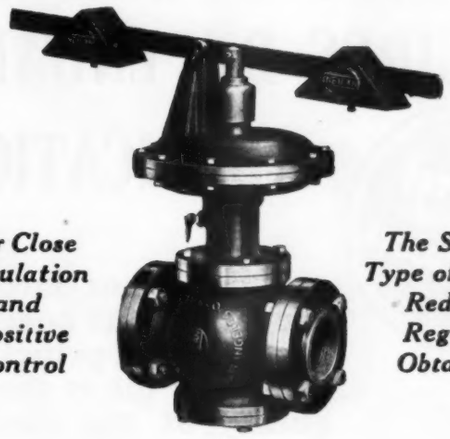
(Continued from Page 97)

line paralleling the Santa Fe Railroad would reach from Chicago to a little town in north central Arizona called Nevin, a distance of about 1,700 miles.

Results of Corrosion

The necessity for new pipe lies in the fact that as a rule the pipe was carelessly set in the first place and has been subjected to the corrosive action of water from the Oswego lime, which overlies the Bartlesville sand. Many wells in the field are at present nonproducing because the pipe has been eaten through and the holes are partly full of water. These wells can be made into oil producers with new casing properly backed up by mud to keep out the water. Other wells not yet made useless by water will come to it in time unless they are protected by new casing, in Mr. Dunn's opinion.

It may be some years before the whole Nowata-Rogers Field will be put on air, but it is the only salvation left to the field, which normally has been slowly but



For Close Regulation and Positive Control

The Simplest Type of Pressure Reducing Regulator Obtainable

NEILAN REDUCING GAS REGULATOR

Designed for service in the oil fields, refineries, and gasoline plants. It is sensitive, accurate and dependable in operation. The valve quickly responds to the least variation of the outlet pressure, and can be relied upon to maintain a constant reduced pressure on the outlet side regardless of any variation of the inlet pressure. Made of iron and steel throughout to resist the corrosive action of hydrogen sulphide gas and other sulphur compounds. It is practically frictionless; has no stuffing boxes; does not chatter or pulsate; and absolutely will not stick or bind.

For reducing inlet pressures of 200 to 400 pounds to any desired outlet pressure from 5 to 10 lbs., 10 to 25 lbs., or 25 to 75 lbs.; or reducing inlet pressures ranging up to 100 lbs., to any outlet pressure from 8-oz. to 1 lb., 1 to 2 lbs., or 2 to 5 lbs. Standard regulators suitable for inlet pressures up to 200 lbs.; extra heavy type for inlet pressures up to 400 lbs.; (Not suitable for dead-end service.)

NEILAN, SCHUMACHER & CO.
641-651 Santa Fe Avenue, Los Angeles, California
Branch: 307 East 4th St., Tulsa, Okla., P. H. Wilkinson, Mgr.

REPRESENTATIVE

Maintenance Engineering Corp., NEILAN 2000 Harrington St., Houston, Texas

"You Can Be Sure of Neilan Products"

AIR LIFT OPERATION REQUIRES DEPENDABLE LUBRICATION

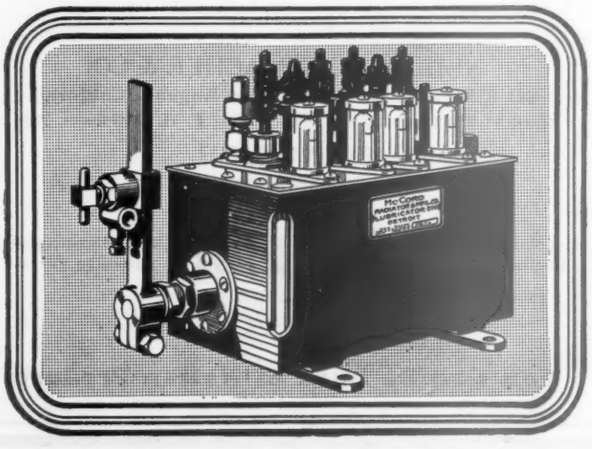
McCord Force Feed Lubricators

An important factor in the successful operation of the air lift principle of pumping oil is the reliability of the compressor. McCord Lubricator equipped compressors maintain the constant air pressure required because every moving part is lubricated continuously with fresh live oil. A McCord lubricator automatically regulates the quantity of oil used in proportion to the speed of operation eliminating waste. The result is a reliability of operation that cannot be obtained otherwise.

Standard of the Oil Fields

Ask your National Supply Co. salesman for full details of the McCord Lubricator for compressor use.

McCORD RADIATOR & MFG. CO.
Lubricator Division
DETROIT, MICH.



surely falling to a stage where it is hardly worth while to try to operate excepting in those rare intervals when the general oil industry is getting a fair price for crude oil.

MECHANICAL FEATURES OF GAS LIFT INSTALLATIONS

(Continued from Page 115)

ing pattern of such sizes and arrangement that wells producing up to 1,000 bbls. daily and at depths up to 3,000 feet may be flowed at pressures which will require only single stage compression.

Depth of Wells

Gas-lift practice in Texas, other than the Gulf Coast region, is confined to wells whose depths vary from 800 to 3,200 feet. There are some wells of less than 800 feet on gas lift but they are unimportant and will not be discussed in this paper. Since the depth of a gas-lift well is a vital factor affecting the formational differential and cannot be changed, its influence therefore must be compensated through a variation of the remaining three factors.

Type and Size of Flow Tubing

In analyzing the present gas-lift practice in Texas it appears that every installation is of a somewhat different type. The trend of operations at the present time seems to be toward those installations which are capable of lifting a barrel of oil to the surface with the lowest gross gas-oil ratio. At first thought, a low gross gas-oil ratio would seem to be highly desirable, and should be indicative of the efficiency of the installation, but if the gas-lift method of production is to occupy a prominent position in the production life of a well or lease the measure of efficiency must be reduced to lifting costs per barrel in dollars and cents and the effect on ultimate production rather than the control of the gross gas-oil ratio.

With respect to this viewpoint, Burnett[2] states:

"Mechanically the gas lift is operating as maximum efficiency when it produces the most oil with the least amount of gas. It may be, however, that increase in volume of gas supplied will result in a decrease of gas production from the well itself and from the standpoint of ultimate yield, this would in most cases be preferable to the mechanically more efficient condition.

"Moreover, an increase in gas volume may substantially increase the oil production and although that increase may be out of proportion to the increased production, the latter may yet be sufficient to justify the poorer efficiency. Cost per barrel produced is the determining factor rather than the mechanical efficiency."

The pressure exerted on the face of a producing sand of a gas lift well is equal to the pressure due to the effective weight of the flowing column of the liquid-gas mixture plus the pressure required to overcome the frictional resistance of this mixture to flow.

Increased Aeration

This pressure may be reduced through increased aeration of the fluid mixture provided the tubing has sufficient cross section area to accommodate the increased flow of gas without requiring a high velocity. Under these conditions the loss in weight of the flowing column due to aeration is much greater than the increase in friction caused by the greater volume of gas flowing with the oil. The result is an overall drop in pressure at the bottom of the tubing. This constitutes the principal advantage of large tubing over small tubing in cases where the rock pressure is subnormal.

In the use of large flow tubing it may be reasoned that the velocity of the gas in the lower portion of the tubing might be so slow, due to the higher pressure of the gas in this portion, that it might not disseminate the oil properly and thus cause heading and "slippage." This is quite likely to happen unless the lower portion of the tubing is reduced to such a size that the initial velocity of the gas-oil mixture will produce a steady flow. The length of the reduced portion need not be more than 10 or 15 per cent of the total length of the flow string.

It is apparent that if the maximum size tubing that can be used in a well is very efficient for low-pressure work it means that one tubing installation is all that is necessary during the gas lift life of the well. This is explained by reason of the fact that when a well is larger than 1,000 bbls. daily it may be flowed by two-stage compression at low gross ratios, and on falling below 1,000 bbls. daily, the high-pressure cylinders of the compressors may be replaced by low cylinders and low-pressure flowing accomplished. Since the surface flow lines and trap installations have been given prominent mention in describing gas lift operations during the past year they will not be discussed other than to say that the trap should be as close as possible to the well and the lead lines be equipped with long radius ells or bends wherever a change in the direction of flow is required. If recirculation of the wet gas is desired, the gas line from the trap to the compressor intake should be large enough to carry the gas with a minimum of frictional losses.

Volume of Circulated Gas or Air

As previously stated, if the flow tubing is of sufficient cross sectional area, the volume of circulating gas may be increased until the working pressure against the face of the producing sand has declined to the point where it requires the least volume of formational gas per barrel of oil produced. If the gas is separated in the trap under pressure, if may be returned to the compressor at pressures above atmosphere and result in a larger volume of circulating gas and a more efficient flowing condition. With any given tubing sizes and arrangement the volume of circulating gas required to do the best work can be quickly determined by simply increasing or decreasing the compressor output and noting the results.

Properties of Mixture in Well

Immediately after the oil-gas mixture from the formation enters the well it comes in contact with additional gas that may or may not be saturated with the volatile hydrocarbon vapors. If the input gas (gas or air) is not saturated it immediately absorbs the gasoline vapors from the oil and results in a progressively higher viscosity of the oil as the pressure drops on approaching the surface. It also increases the rate of paraffin deposition on approaching the surface. When wet gas is recirculated by means of single-stage compression and all of the vapors and condensate allowed to return to the well these conditions cannot happen. It is, therefore, well to state at this time that gasoline plants which take the gasoline out of the recirculated gas are a serious detriment to gas lift operations. They should be permitted to take the gasoline out of only that portion of the total wet gas production which escapes to the air. A single-stage compression plant which returns all vapors and condensate to the well accomplishes the same work as the gasoline plant without the first cost or maintenance of the gasoline plant. The recirculation of the wet gas merely stops the separation of gasoline from the oil and delivers it to the tanks at the maximum gravity possible.

The following summary shows the comparative results on a well in the Noodle Creek Field, Jones County, which was changed from two-stage compression flowing at moderate pressures to single-stage flowing at low pressures. This well has been surrounded during its entire lift by pumping wells as no wells in this field have ever flowed even when first completed. The rock pressure was very low and the formational gas-oil ratio was only 150 cubic feet per barrel on completion of the well.

[2]Robert Burnett: Air and Gas Lift Methods and Equipment.

BARCO Balanced and Lubricated PLUG VALVE

See our exhibit at the New York Power Show.

LUBRICATED by the pressure system. Lubricant is not used hydraulically to push the plug off its seat. A very small amount of lubricant is therefore required.

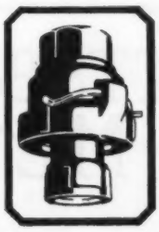
Even the packing lasts indefinitely in the Barco valve. Packing is not depended on primarily to keep this valve tight although packing is provided around the stem to care for seepage and capillary attraction when the valve is not properly adjusted or lubricated.

Try Barco valves for any service in the field, at refineries, storage farms, or tank stations. Among the varied applications many of these valves are being used on distillate lines with excellent results.

A new Bulletin, number 307, is ready for distribution. Ask for your copy.

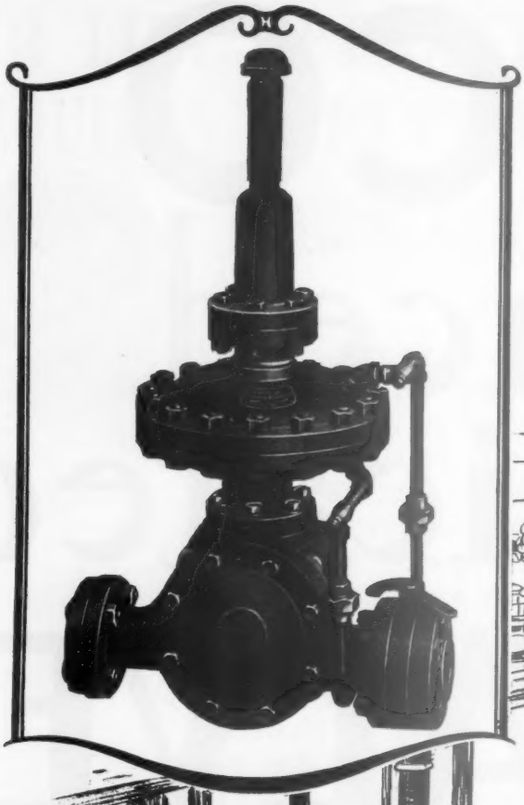
BARCO MANUFACTURING COMPANY
1801 Winnemac Avenue, Chicago

BARCO

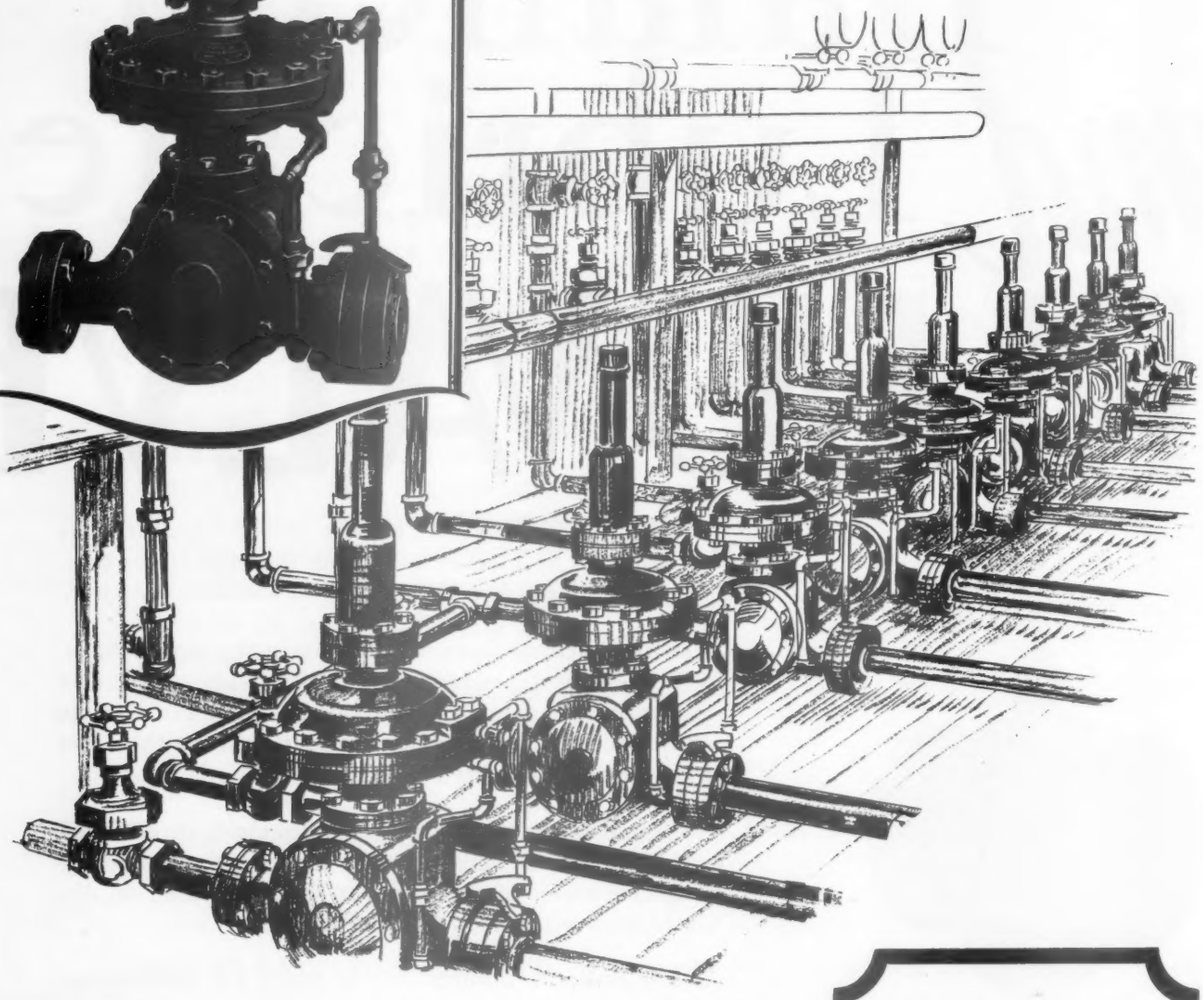


Valves and Joints

O&GJ 10-20 Gray



Positive flow control for Air Lift Operation



Nine EMCO
FLOW CONTROLLERS—ONE INSTALLATION

PITTSBURGH EQUITABLE METER COMPANY

PITTSBURGH, PA.

BRANCH OFFICES
New York, New York.
Chicago, Illinois.
Dallas, Texas.
Los Angeles, Cal.
Tulsa, Oklahoma.
Seattle, Washington.
Columbia, S. Carolina.
Salt Lake City, Utah.
Kansas City, Missouri.

AIR-GAS LIFT AND ULTIMATE PRODUCTION

(Continued from Page 122)

production almost doubled the previous gas-lift production but the gas-oil ratio showed a tendency to increase rapidly. The increase in the gas-oil ratio was stopped by decreasing the amount of gas circulated until the latter part of 1926.

The encroachment of water into the well began increasing rapidly until the well was producing 30 per cent water, and the amount of gas introduced into the well had to be increased gradually in order to handle the increasing water production. The gas-oil ratio indicated a tendency to rise as long as the gas introduced into the well was increased. In June, 1927, a large portion of the water production was eliminated and the gas introduced into the well was decreased with a corresponding decrease in the gas-oil ratio. The drop in casinghead pressure in June, 1926, with the corresponding gas and oil increases, indicated a decrease in the effective back-pressure throughout the producing horizon which increased the gas-oil ratio temporarily. However, by continuing the decrease in the effective back-pressure by decreasing the gas volume circulated until the end of 1926, the gas-oil ratio was again decreased. From the end of 1926 to the middle of 1927, the gradual increase in effective back-pressure was accompanied by an increase in the gas-oil ratio. During the past two months the decrease in the effective back-pressure has been accompanied by a decrease in the gas-oil ratio. A change in the relationship between effective back-pressure and gas-oil ratio during 1926 and 1927 is indicated. This curve illustrates the close relationship existing between gas circulated and gas-oil ratio.

Chapman Well No. 7

During 1925, this well was pumping less than 200 bbls. per day with the production remaining almost constant. The gas-oil ratio was declining until the last two months in the year when it increased rapidly. In February, 1926, the well was put on the gas lift with a substantial increase in production. The gas-oil ratio was increased to more than double. By increasing the volume of gas delivered to the well, it was found that the gas-oil ratio decreased until it was lower than the previous pumping ratio. During 1926 the relation between the effective back-pressure and the gas-oil ratio was such that the gas circulated and the gas-oil ratio were inversely proportional to each other. In the first part of 1927, however, with the gas circulated remaining almost constant, the gas-oil ratio decreased. A change in the relation between gas circulated and gas-oil ratio was taking place, so that from May to July, 1927, within the same numerical limits as before, the gas circulated and gas-oil ratio were then directly proportional to each other. With no changes in operation other than gas volumes circulated, the relationship existing between gas circulated and gas-oil ratio has been directly reverse during two years.

Chapman Well No. 19

In the first part of 1925, this well was flowing about 390 bbls. per day with a gas-oil ratio of 2,550 cubic feet per barrel. The decline in production was normal throughout 1925 with an increase in the gas-oil ratio until December. The well started to flow intermittently and the gas-oil ratio increased to 3,650 cubic feet per barrel with the oil production averaging 200 bbls. daily. The well was then placed on the gas lift with a decreased in the gas-oil ratio to 1,000 cubic feet per barrel with an increase in production to 415 bbls. daily. Since that time, the oil production has declined slowly, the gas production remained about the same and the gas-oil ratio gradually increased. While on the gas lift, the gas volume circulated was slowly decreased to the first part of 1927 and since then has been gradually increased. During the past few months of 1927, the gas-oil ratio has shown little change, remaining under 1,400 cubic feet per barrel.

Chapman Well No. 25

This well was completed in October, 1926, and pumped for the balance of the month. The production averaged 190 bbls. with a gas-oil ratio of 1,670 cubic feet per barrel. It was placed on the gas lift in November, increasing the production four times and decreasing the gas-oil ratio by one-half. Since that time, there has been a normal decline in the production accompanied by an increase in the gas-oil ratio. During this period, the gas volume delivered to the well has been decreased every month so that in the 10 months that it has been on the gas lift, the gas volume introduced has dropped from 2,600,000 to 800,000 cubic feet daily with no changes in operation except a definite decrease in the gas volume circulated. The gas-oil ratio has continued to increase but is still at a much lower point than the ratio obtained during the pumping operation.

Coyle and Bogue Well No. 3

During the first part of 1925, this well was still flowing about 250 bbls. per day with a gas-oil ratio of about 1,600 cubic feet per barrel. During May the production started to decline rapidly as the well commenced flowing by heads and the gas-oil ratio increased very rapidly so that by July the production had dropped to 110 bbls. per day with a gas-oil ratio of 4,700 cubic feet per barrel. At this time the well was placed on the gas lift with an increase in production and a very pronounced decrease in the gas-oil ratio. While on the gas lift there has been a normal decline in production accompanied by an increase in the gas-oil ratio but the gas production from the formation has remained practically constant and at the same point as that produced while originally flowing. This well is peculiar in that there is a gas sand lying just below the water shutoff and the volume produced from this sand is apparently more or less constant irrespective of the various changes in gas circulated, tubing depth or other adjustments made on the well. For this reason the apparent gas-oil ratio has steadily increased as the well's production declined.

Morse Well No. 3

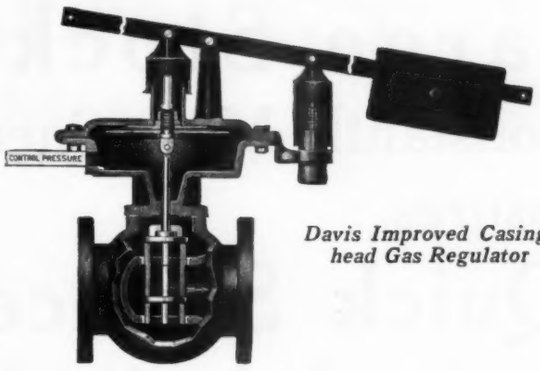
In the first part of 1925 this well was flowing naturally and starting to head. The gas-oil ratio increased to 2,500 cubic feet per barrel but was then decreased to an average of 1,500 cubic feet per barrel by beaning the well until August, 1925. About this time the well was placed on the gas lift and the production increased about four times. The gas-oil ratio was decreased by more than one-half. In the initial gas-lift operations, the gas-oil ratio increased steadily until adjustments were made removing all pressure possible from the tubing head and decreasing the gas volume circulated. From the middle of 1926 to the present time, the oil production has declined while the gas-oil ratio has shown a tendency to decline. This curve serves to illustrate the relation between tubing head pressure, casing pressure and gas volume circulated in their relation to the gas-oil ratio with the tubing diameter and depth remaining the same.

NEW A. I. M. E. OFFICIAL

Karl Eilers of New York was elected director and treasurer of the American Institute of Mining and Metallurgical Engineers at the recent meeting of the board of directors to fill out the unexpired portion of the term of Charles F. Rand recently deceased. Mr. Eilers' father was one of the pioneer members of the institute and he has himself previously served on the board. He is a distinguished metallurgist, formerly a member of the executive committee of the American Smelting & Refining Co., is now in private practice, and in 1914 received an honorary degree from Columbia University where he graduated from the School of Mines with the class of 1889.

A. I. M. E. TO VENEZUELA

NEW YORK, Oct. 15.—More than 20 members of the petroleum division of the American Institute of Mining and Metallurgical Engineers have already signified their attention of going on the proposed cruise to Panama and Venezuela planned for next February, in connection with the annual meeting of the division.



Davis Improved Casinghead Gas Regulator

DAVIS Improved Casing Head Gas Regulators automatically control the vacuum on oil wells in the manufacture of gasoline. They are easily installed and unusually dependable in service.

High velocity flow does not affect the action of this regulator. Extremely accurate regulation can be secured when desired by taking an equalized control vacuum from the line a short distance from the valve.

Interchangeable diaphragm chambers, with standard diaphragm size for all regulators from 2 to 8 inch sizes, greatly simplify repairs and maintenance. Accurate, consistent service in the most exposed locations is insured by the complete weatherproof construction. Thousands of installations prove the success of Davis Gas Regulators.

G. M. DAVIS REGULATOR CO.
409 Milwaukee Avenue
CHICAGO, ILLINOIS

WESTCOTT & GREIS, Inc.
Sales Engineers
TULSA LOS ANGELES DALLAS

Valve Makers For Over Fifty Years
DAVIS VALVE SPECIALTIES

O&GJ 10-20 Gray

The Ludlow

Large Stocks
Constantly Maintained
Insures
Quick Service
on Your Valve Needs

TRADE LUDLOW MARK

All Sizes and Kinds
For Any Pressure
For Every Type of Service

LUDLOW is the *dependable* source for highest quality and fully guaranteed valves and fire hydrants. Pioneers in the manufacture—they have gained a knowledge and an organization that build the best products possible. Stocks are maintained to give quick service, too—particularly for the oil industry's need.

Distributed Near You By

Mid-Continent Supply Company, Fort Worth, Texas

Harrisburg Pipe & Pipe Bending Co., of Texas, Inc., Houston, Texas

Peden Iron & Steel Company, Shreveport, La.

Henderson Iron Works, Shreveport, La.

THE LUDLOW VALVE MFG. CO.
TROY, NEW YORK

BRANCH OFFICES
KANSAS CITY PITTSBURGH
CHICAGO BOSTON

Double Gate Parallel Seat Valve

LIGHTNESS OF STEEL DEMAND BRINGS WEAKENING OF PRICES

By B. E. V. Luty

PITTSBURGH, Pa., Oct. 17.—The steel trade has continued losing ground, although quite slowly. Conditions grow more unsatisfactory to producers almost from week to week. There is a good bit of complaint about the state of affairs, and the typical producer would leave one to infer that the objectionable feature of the steel situation is the lightness of demand, particular reference being made to railroad and automobile trade demand being poor. Cross questions, however, develops that the steel situation is more unsatisfactory as to prices than as to actual tonnage. Various lines have been weakening, and even pipe is now under suspicion.

Production of steel (in ingot form) in September was 3.3 per cent under the August rate and at the lowest rate thus far this year, whereas the trade expects July to be the low month, with successive increases thereafter. September production was 16.8 per cent under that of a year previous. The total for nine months shows only 5.4 per cent loss, due to the fact that in the first five months there was a gain, the rate thereafter dipping farther and farther below that of a year previous. However, the year's total bids fair to be less than 10 per cent under that of 1926, which was a record year, and as 1925 had also been a record year it would be phenomenal for there to be three record years in succession.

Unfilled Tonnage

The United States Steel Corp.'s unfilled tonnage had a small decrease in September, 47,924 tons, after three months of small increases. September did not have the usual advantage of contracts, as price conditions were such that in no line did buyers have any incentive to make contracts. The corporation's shipments were approximately 71 per cent of capacity in August and 68 per cent in September, the unfilled tonnage changes indicating that bookings were about 75 per cent of capacity in August and 64 per cent in September.

The agricultural implement industry is taking more steel than formerly, and there may be some little increases elsewhere, but in general the trend in demand is downward. The automobile industry has been tapering off and now some important factories are closing for inventory taking, which of course they would not do if there were any occasion to operate. The railroads are doing little buying except that the annual rail buying movement is on, some 400,000 tons having been bought thus far. The rail mills will get some rollings in the next two months but in general the deliveries in connection with the present buying cover the first six months of next year. Fabricated structural steel lettings have been running rather light in the past few weeks.

Buying of oil country tubular goods is now at a very low rate, the season being practically ended. Distribution of standard or merchant pipe has decreased but little if at all, but its season also will soon be over. There is no definite news as to line pipe orders, which may be placed quietly at any time.

Pipe Mill Operations

Pipe mills are hardly operating at as much as 50 per cent of full capacity. Operations have been tapering off since about September 1, when practically all the old line pipe business of importance was cleaned up.

There are reports of important irregularities in pipe prices, but these cannot be confirmed. All that can be secured definitely is an admission that jobbers are now being accorded an additional discount of 3½ per cent on direct shipments of carload lots, it being claimed prices for shipment into jobbers' stocks are unaltered.

The sheet market has definitely dropped $2 a ton from the asking prices of the past five months, which were never fully observed. It is admitted by some mills that they have marked down prices on unfilled orders to confirm with the lower market: Blue annealed, 2.15 cents; black, 2.90 cents; galvanized, 3.75 cents; automobile sheets, 4.15 cents. Bars, shapes and plates are generally at 1.75 cents, not much tonnage moving at the small lot asking price of 1.85 cents. Forging billets are $38 to $40 for ordinary quality.

LOUISIANA-ARKANSAS CRUDE STOCK REDUCED

SHREVEPORT, La., Oct. 15.—A considerable improvement in the crude situation in the North Louisiana-Arkansas division was indicated in the fact that stocks October 1 were 1,239,729 bbls. less than on the first day of the previous month. Total storage on October 1, according to figures just compiled, was 29,142,297 bbls.

In only one district was there an increase in stocks, that being Nevada County, Arkansas. The gain there was very substantial, amounting to 142 538 bbls., with the total storage 400.739 bbls., including both earthen and steel. This has particular significance for the fuel oil market as so far the principal use for the crude produced there has been for fuel.

The domestic and industrial fuel oil market in Arkansas has been sluggish, which has accounted for some of the piling up of stocks. However, there has been a steady run of completions of good wells in that county the past 60 days which has materially boosted the production of the field, the latter in turn probably being somewhat responsible for the weakness in the market.

It will be noted by the accompanying table that stocks in the Smackover Field were reduced 649,883 bbls. during September. Despite the noticeable withdrawal from storage in Smackover and a continued drop in production, crude postings in the field were reduced 10 cents on all grades by all companies during the month.

Stocks by districts on October 1 and September 1 were:

	Oct. 1	Sept. 1
Arkansas		
Smackover (steel)	6,142,752	6,136,223
Smackover (earthen)	6,975,262	7,631,674
Total	13,118,014	13,767,897
Nevada County (steel)	125,497	133,201
Nevada County (earthen)	275,242	125,000
Total	400,739	258,201
El Dorado	2,463,442	2,467,985
Total Arkansas	15,982,195	16,494,083
North Louisiana		
All fields	13,160,102	13,887,943
Total both states	29,142,297	30,382,026

DEATH OF JOHN MAGEE

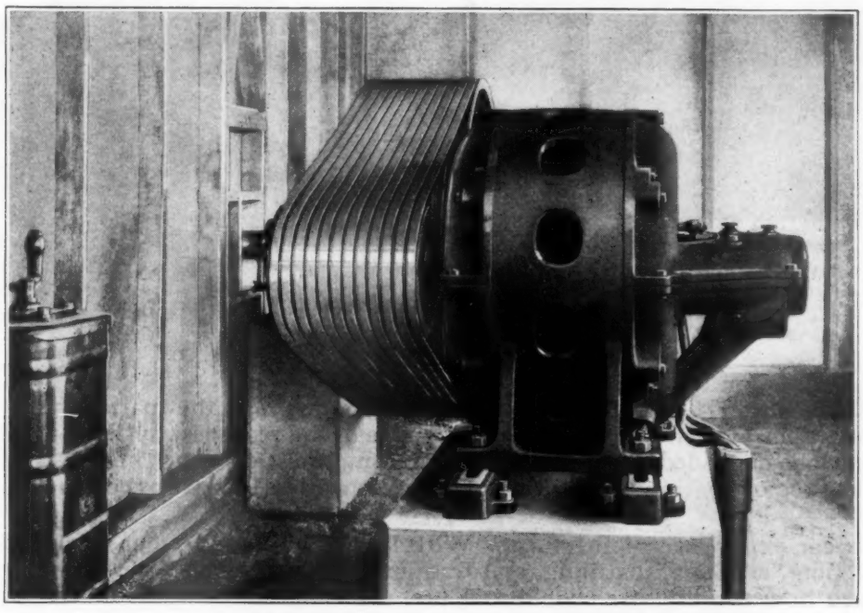
PITTSBURGH, Pa., Oct. 15.—John Magee, Bovard, Pa., retired pipe line worker, died at his home last week after a prolonged illness. Mr. Magee was born at Forrestville, Butler County, in 1853. He engaged in the pipe line business with the old Karns City Pipe Line Co. in 1874. In 1877, the Karns City Pipe Line was taken over by the United Pipe Lines. In the following year he was transferred to Cole Creek, McKean County. The following year he went with the Tide Water Pipe Line at Derrick City. Two years later he returned to Butler County and engaged in the producing business at Bruin, Butler County, Pennsylvania. Some years later he retired and had for 38 years resided at his home at Bovard. Two brothers survive, Samuel Magee of Bradford, Pa., and T. M. Magee, retired superintendent of the Southwest Pennsylvania Pipe Line Co.

PROSPECTING IN PERU

A party of field men of an American oil company has arrived to commence the exploration of the government oil reserve, about 5,000 square kilometers south of the Chira River in the Province of Pirua, Peru.

ALLIS-CHALMERS

Heavy Duty Motors
and
Texrope Drives
For Driving
Air and Gas Lift Apparatus



150 H.P. Allis-Chalmers Motor and Texrope Drive in Oklahoma Field. 3½ to 1 speed reduction on 5′ centers.

Short Centers—Saves construction and housing expense.

Efficient and economical.

Positive and flexible.

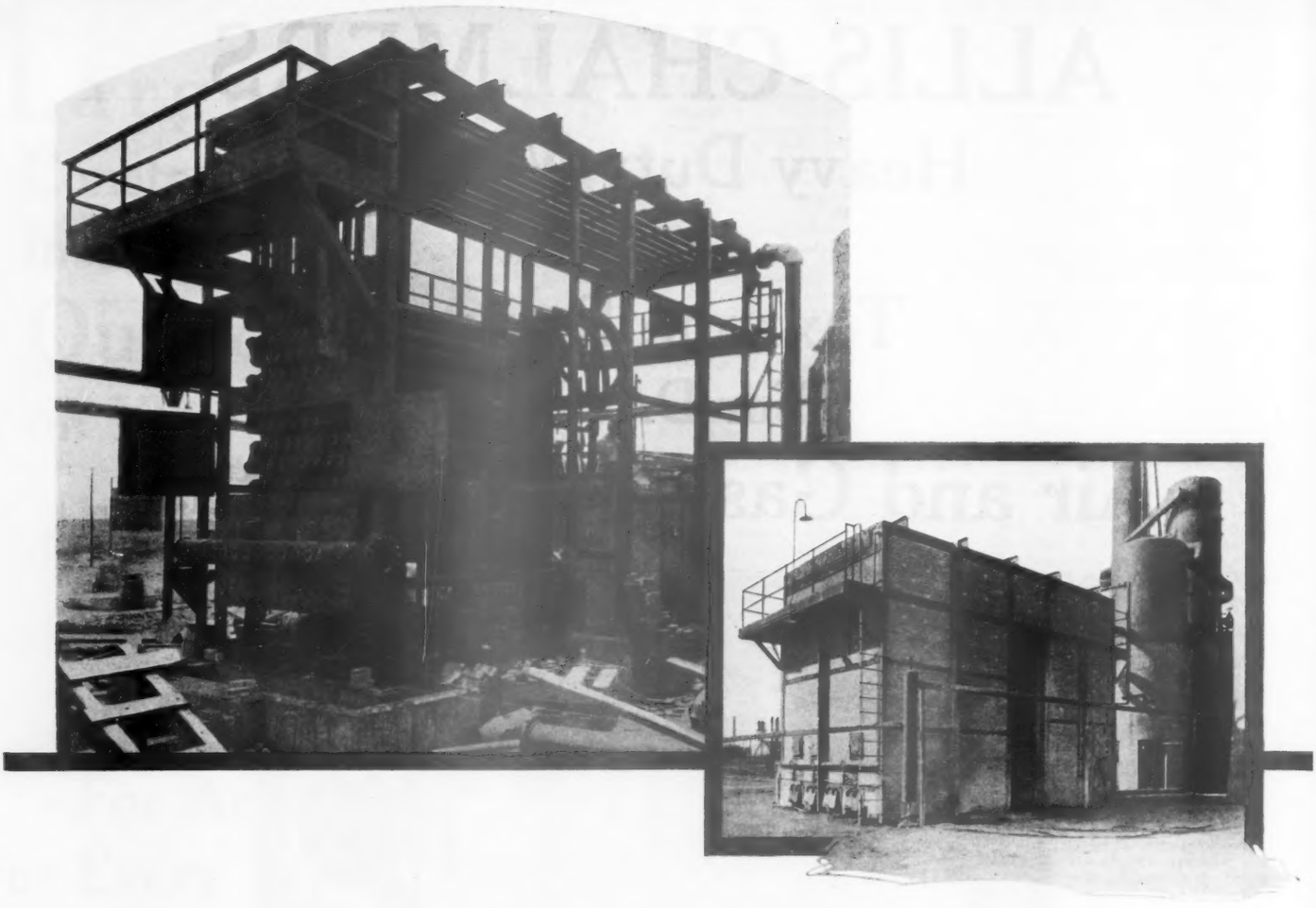
Motors built for hard and continuous duty.

Both motor and Texrope Drive built by one company—No division of responsibility.

Oil Field Offices at

HOUSTON DALLAS NEW ORLEANS ST. LOUIS
KANSAS CITY DENVER LOS ANGELES EL PASO

ALLIS-CHALMERS
MILWAUKEE, WISCONSIN



EVERY Foster Tube Still is especially designed for the particular operating conditions of each installation. This is one of the reasons why Foster Tube Stills can always be depended upon for low fuel consumption, efficient heat transfer and proper degree of heating without danger of overheating the oil or the heating surface.

The 25-year experience of the Foster Wheeler Engineers is at your service in solving your topping, cracking, distilling, and fractionating problems. We are prepared to show you how the improved yield and fuel consumption being obtained in over 600 Foster Tube Still installations can be duplicated in your plant.

FOSTER WHEELER CORPORATION
165 Broadway, New York
Branches in all oil centers

FOSTER
The TUBE STILLS
with the protected surface

PROBLEMS IN HANDLING OIL IN PANHANDLE

(Continued from Page 122)

test regains its original value slowly. Immediately after heating, the cold test is 0 degrees Fahrenheit, or below, and a period of 12 to 30 hours elapses before the cold test comes back to 32 degrees Fahrenheit.

Winter movement of Panhandle crude through lease and various pipe lines had to be carried on with heated oil. All lines were buried 30 to 36 inches below the surface to reduce loss of heat. The loss of heat units from a heated oil line buried in the soil is that heat lost by conduction to the surrounding soil. The loss of heat is controlled, therefore, by the heat conductivity of the soil. Some typical conductivities are tabulated below, where

K = B.t.u. lost per square foot exposed surface per hour per degree Fahrenheit difference in temperature per foot thickness.

Heat Loss to—	K
Dry sand	0.2
Dry soil (summer)	0.2
Damp soil (winter)	0.75
Wet sand	2.00
Sand and moving water	2.00 plus
Air	2.00 plus

These data indicate the value of laying lines in a location with good drainage and protected from air and water currents.

Viscosity-Temperature

Another important characteristic of Panhandle crude is the large viscosity-temperature effect. Panhandle crude at 125 degrees Fahrenheit approaches high gravity Mid Continent crude in its viscosity; at 50 degrees Fahrenheit the viscosity is comparable to a low-gravity asphalt base oil. This termo-viscosity effect is an added reason for heating the oil for transportation as capacities of the lines are greatly increased. Operation of pipe lines at maximum capacity reduces the time the oil is in the line and reduces the amount of heat loss per barrel of oil moved. Advantage may then be taken of this by having the average and final line temperature, for the same initial temperature, much higher, or by reducing the intake temperature and B.t.u. per barrel necessary to insure the same average and line temperature necessary as when pumping a smaller amount of oil.

Table 9 summarizes a few sample calculations as to what may be expected for an 8-inch line buried 36 inches under adverse conditions since K is taken as 1 and the soil temperature 32 degrees Fahrenheit.

Soil Temperature

The normal soil temperature at the time these tests were performed was between 45 degrees and 55 degrees Fahrenheit. The oil entered the pipe line at 120 degrees Fahrenheit and left the pipe line 11 miles away at 92 degrees Fahrenheit. The pipe line was handling approximately 24,000 bbls. daily at the time with a loss of 28 degrees Fahrenheit, or 2.55 degrees Fahrenheit per mile. This corresponds to an average earth conductivity of K = 0.68.

The presence of small amounts of silt and the ever-present danger of paraffin forming in the pipe at points off sudden cooling (caused by water currents, etc.) necessitates the frequent use of line scrapers or go-devils. Scrapers may be sent through the modern welded lines with little danger of the scraper hanging up in the line. The accepted practice in the Panhandle is to send a scraper through the line daily, or every other day.

As a result of exhaustive studies of the characteristics of Panhandle crude, the following practices have been put into force:

The pipe line companies require that the oil be delivered to them on the lease at 90 degrees Fahrenheit. This insures a good quality pumping fluid and a sufficiently high temperature to insure delivery to the station or tank farm.

Continuous operation is desirable in order to prevent the oil from congealing and the building up of high pressures when operation is again started. A shut down of short duration can be tolerated due to the cold test lag, but a shutdown of 12 or more hours may prove serious. Heat must be supplied continuously to the soil to maintain the temperature gradient. It takes more heat units to bring soil temperatures up to a steady state than to maintain them in that state. A shutdown of a heated line allows the soil heat to dissipate. The extra heat needed to restore the steady state must come from the fresh oil which will be, in turn, cooled proportionately, and the friction and pressure increased.

Another interesting point brought out by these calculations, in order to determine the optimum heating temperature and location of stations was the saving in heat due to the lessened distance between stations. Table 11 shows the results which may be expected for the same conditions as used in Table 8.

Table 11 shows that to maintain a temperature of 60 degrees Fahrenheit at the end of a pipe line that a spacing of stations 11 miles apart over a 15-mile spacing, results in a fuel saving of 27 per cent, and a spacing of 7.5 miles, or half the 15-mile spacing, results in a fuel saving of 51 per cent. Heating station investment and operation costs would be increased 36 per cent for the 11-mile plan and 100 per cent for the 7.5-mile plan. A balance on fuel cost and flexibility would determine the most economic design for any one set of conditions.

Effect of Paraffin on Corrosion

Panhandle crude contains an average of 0.8 per cent sulphur. The gas in the granite wash area is sweet, while the gas in the lime area is sour, containing 0.4 to 0.8 per cent hydrogen sulphide. The well brines are corrosive and the mixture of hydrogen sulphide and water constitute a highly corrosive mixture. There are a few gas-lift plants in the Panhandle obtaining their dry gas from the gasoline plants. This treated gas contains 1 to 10 per cent air and the use of this gas to flow wells adds oxygen to the corrosive elements existing in the wells. Notwithstanding the corrosive well waters, the sulphur gas and the oxygen, very little corrosion of well tubing occurs. It has been noticed that corrosion in the Panhandle is limited to those metal surfaces free of paraffin. It has previously been noted in this article that in most gas-lift wells that paraffin forms from the bottom to the top of the tubing. Corrosion should be the greatest in gas-lift wells, but is found to be very small in extent. The paraffin forms a protective coating and considerably reduces the corrosion to be expected.

GAS FACTOR AND PRODUCTION EFFICIENCY

(Continued from Page 116)

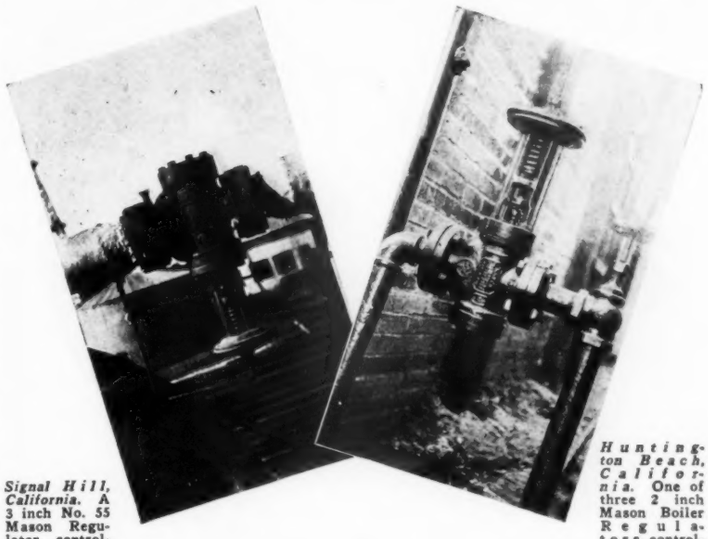
the walls of the well. Every additional well drilled within the drainage radius of another well thus becomes a center of rapid gas expansion and is therefore to be regarded as a liability in the gas-energy balance sheet. Providing the wells are not spaced beyond oil-drainage radius of each other, the fewer the number of wells used, the less rapidly will the oil be drained; and because of the lower average rate of flow of fluids through the sands, the energy consumption per barrel of oil produced will be lower. Hence the ultimate recovery of oil will be greater for widely spaced wells than for closely spaced wells, providing the interval between wells does not exceed the natural radius of oil drainage.

To many this will seem to be a fallacious conclusion, for it is directly contrary to generally accepted belief. The writer, however, has additional proof in the results of a series of experiments conducted in the pressure drainage tank mentioned in the previous section. A group of tests were performed in which the initial sand, oil and pressure conditions were identical, but in which the number of wells used in draining the tank were varied in successive tests. Table 1 gives the results. Inspection of the data will show that the ultimate recovery decreased steadily as the number of wells increased, except that two wells produced more than one.

Table 1

Results of pressure drainage tank ex-

MASON REGULATORS ON THE JOB



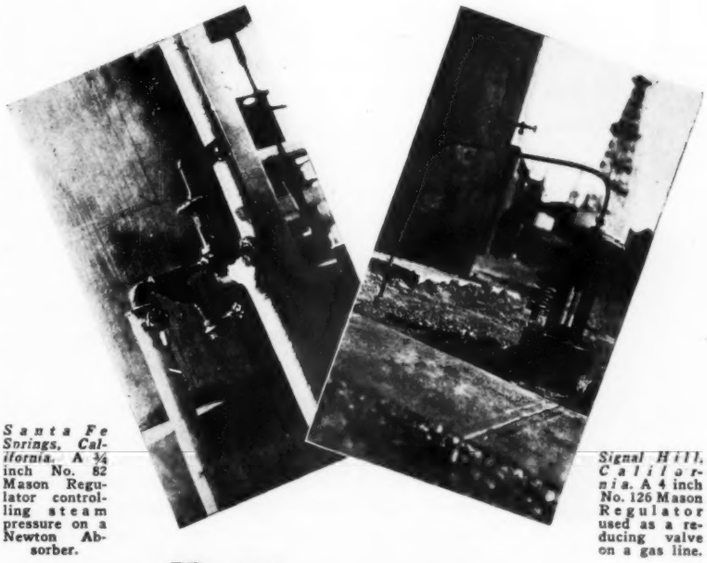
Signal Hill, California. A 3 inch No. 55 Mason Regulator controlling steam pressure in a still.

Huntington Beach, California. One of three 2 inch Mason Boiler Regulators controlling gas fires on a battery of boilers.

In the field or in the refinery, you will find Mason Regulators on the lines where accurate pressure control must be maintained.

They can be depended upon to handle every pressure requirement, no matter how varied, and their accuracy does not lessen with long, continued use.

Write for booklet "Mason Regulators for Oil Field Service" or for Catalog No. 62.



Santa Fe Springs, California. A ¾ inch No. 82 Mason Regulator controlling steam pressure on a Newton Absorber.

Signal Hill, California. A 4 inch No. 126 Mason Regulator used as a reducing valve on a gas line.

Mason Regulators

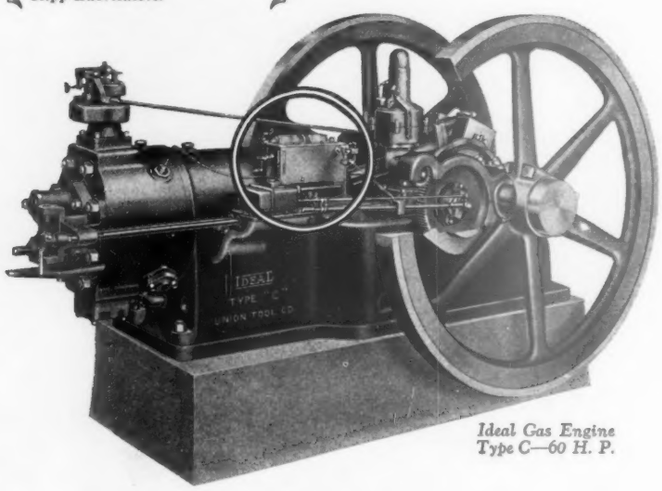
MASON REGULATOR CO.
Boston, Mass.

Muskogee, Oklahoma — Atlas Supply Co.
Los Angeles, Calif. — Warren & Bailey Co.
Houston, Texas — J. A. Rossiter Co.

1246

all over the world Madison-Kipp Lubricators are leading

70% *of all Oil Engines built in America and a considerable percent of foreign built engines are equipped with Madison-Kipp Lubricators.*



Ideal Gas Engine Type C—60 H. P.

On the Union Tool **IDEAL** Engine

The Madison-Kipp Fresh Oil Lubricator is now Standard Equipment for the Ideal Gas Engine, manufactured by the Union Tool Company, Torrance, California.

Fresh Oil is unfailingly supplied to cylinder, main bearings, crank ring oiler, piston pin, timing gears and governor by the Madison-Kipp Lubricator.

Due to the unique Madison-Kipp valveless and registering-port principle the Madison-Kipp Lubricator unfailingly delivers Fresh Oil in measured quantities to the cylinders regardless of the speed at which either engine or lubricator is running.

So long as the engine or pump equipped with Madison-Kipp Lubricators runs, the Madison-Kipp *keeps it properly lubricated.*

The sight feed indicator shows accurately the oil *that it delivered to the engine.*

Madison-Kipp Lubricators are flexible in size, oil feed adjustment, type and drive location. They can be readily applied to any engine, pump or compressor in the field. They are built with the ruggedness necessary to stand up to oil field work for *long periods* of time *without repair.*

They are stocked in Oil Field Supply Stores.

MADISON-KIPP LUBRICATORS are easily applied in the field on

Oil, Gas, Steam Drilling Engines
Oil, Gas Pumping Engines
Compressors
Steam Pumps
Slush Pumps
Stationary Power

Directions for application are in the box of the Lubricator.

FRESH OIL Madison-Kipp Lubricators

Lubrication Specialists Since 1890 Madison, Wisconsin, U.S.A.

periments to determine influence of well spacing on ultimate recovery:

No. wells Producing	Ttl. Recovery of Oil cu. Cm.	Per Cent Recovery
1	103.750	25.7
2	117.100	29.0
3	105.700	26.1
4	102.500	25.4
5	101.100	25.0
6	99.300	24.6

Other evidence pointed to the conclusion that a single well did not completely drain the tank, but that two wells were sufficient for the purpose and additional outlets beyond this number, were within oil-drainage radius of each other and were therefore productive of gas wastage and energy loss.

The results of these experiments and the theoretical considerations outlined above, lend support to the theory that close spacing of wells as represented by "town lot" development in many western and Mid-Continent oil fields, is wasteful of gas energy and results in a lower ultimate recovery of oil than would be possible by wider spacing. When wells are drilled within oil-drainage radius of each other, the prevailing gas factor will be generally higher than in areas in which a proper interval between wells is maintained. The writer believes that additional proof of this theory may be found by a close scrutiny of production data in fields in which variable spacing of wells in different comparable areas has been practiced.

The Production Method

There is no doubt but that the production method employed, the degree of well control and general production technic of the operator have an important influence on the gas factor and on gas-energy consumption. A naturally flowing well is inefficient in this respect, and leads to higher than normal gas factors, because the formational gas is required not only to drive the oil into the well, but also to lift it to the surface. In the case of a 3,000-foot well, about 930,000 foot-pounds of work must be done in merely lifting each barrel of oil to the surface after it enters the well. Assuming 100 per cent efficiency, a well producing, say, 1,000 bbls. per day from this depth, must thus continually expend 19.57 horsepower. It is known, however, that due to gas slippage and other inefficiencies, flowing wells have a very low efficiency, seldom exceeding 20 per cent and often much lower. Assuming 20 per cent efficiency, the actual power consumption is nearly 100 horsepower. The formational gas must furnish this energy in naturally flowing wells, and hence their gas factors are higher than when other methods of lifting the oil are employed.

Gas-lift wells can be considerably more efficient in so far as consumption of formational gas energy is concerned, for here external energy in the form of gas compressed and forced down into the well, supplies the greater part of the energy necessary to lift the oil. It is to be noted, however, that even in a gas lift well, the formational gas must provide a part of the energy necessary to lift the oil to the surface. If the volume of gas forced down from the surface be measured and subtracted from the total volume of gas reaching the surface, the formational gas factor—in which we are here primarily interested—will be found materially lower than in naturally flowing wells producing under comparable conditions.

For maximum efficiency in any type of flowing well, it is important that the well be tubed to the proper depth. Tubing depth not only influences the lift efficiency, but may, under favorable circumstances have a favorable effect in reducing gas channeling in the sands about the well.

A pumping well may operate more efficiently than any other in so far as consumption of natural gas energy is concerned, for here the formational gas is called upon to supply only enough energy to force the oil into the well, and mechanical power employed in lifting the oil to the surface, is supplied entirely from external sources. If flow of gas between the well tubing and the enclosing casings is prevented, and the pump is placed at a suitable level in the well to prevent channeling of gas toward the well in the reservoir sand, a pumping well may operate with a lower gas factor than a well operated by any other means.

In some fields, edge-water pressure aids materially in forcing the oil into the wells, the oil being produced with comparatively little formational gas. It should be recognized in such cases that we are dealing with a radically different type of expulsive force and that the gas factors obtained in wells producing by this means, are in no sense comparable with those obtained in other fields where production is secured entirely by the expulsive force of expanding natural gas.

Economic Life of Oil Property

While the ultimate oil recovery will be increased through application of the proper degree of back pressure to producing oil wells, the time within which production is secured is ordinarily extended over a longer period than when no back pressure is used; and it will perhaps happen that the critical back pressure giving maximum ultimate oil recovery, will result in unduly prolonging the period of exploitation. Under the highly competitive organization of the present-day oil-producing industry, an operator may find it expedient, or more profitable, to accept a smaller total yield from his property in a short period of time, than to extend operations over a longer period for a greater ultimate yield.

The "economic life" of an oil-producing property, or the total life-period as determined by the rate of production yielding maximum profit—a conception which involves consideration of the cost of production, the selling price of oil, the interest rate demanded on capital and many other economic as well as physical factors—is inextricably interwoven with the whole subject of gas conservation. From the standpoint of the producer, the rate of production, which is determined by the back pressure employed and the resulting gas factor, must be an economic one; that which will result in maximum ultimate profit.

The gas factor which results in maximum ultimate oil yield will ordinarily not be the one which is productive of greatest ultimate profit to the producer. The oil conservationists and industrialists must therefore seek a middle ground between these two viewpoints in determining what constitutes a reasonable recovery efficiency that will be in accord with the public interest in a rapidly diminishing national resource, and yet fair to the producer from the economic standpoint. Price must control in the final analysis; higher price will compel more efficient recovery, while a depressed price structure will encourage production inefficiency.

Conclusions

The objective of this paper is to emphasize the fact that the gas-oil ratio or gas factor of a producing oil well, is not a reliable index of production efficiency unless the influence of a variety of other contributing factors is taken into account. The several variables which have a bearing on the magnitude of the gas factor are reviewed and their influence is explained.

The discussion and data offered apparently justify the following conclusions:

1. The volume of gas produced with a unit volume of oil is not in itself a measure of production efficiency unless the pressure from which the gas expanded to its measured volume is taken into account. The gas factor is of interest only as a measure of energy consumed, and has not significance until considered in relation to the initial pressure at which it existed within the reservoir sand. Release of pressure within the reservoir said, occasioned by production of oil and gas, results normally in a gradual increase in the gas factor. It is suggested that a better basis of comparison for oil well production efficiencies would be found in the product of the gas factor by the number of times the volume of the gas has increased in expanding from the formation pressure to that at which it is measured.

2. The flow resistance offered by the reservoir sand to passage of oil through it will primarily determine the energy

(Continued on Page 144)

BACK PRESSURE AND ULTIMATE RECOVERY

(Continued from Page 100)

This condition is realized on account of the highly saturated condition existing at the bottom of the hole and the minimizing of the differential between the formation and the well. Whether a well is being produced by the gas lift or is flowing natural, the effect on its ultimate production is controlled by the pressure conditions in the well.

When considered as a means of back-pressure control the gas lift may be compared to natural flowing wells under back- pressure. The formation below the flow is of first importance and is governed by the same factors as a natural flowing well. The flow in the tubing, which is a means of controlling the flow differential, has, heretofore, been given much detailed discussion and is given secondary importance in this discussion.

An Actual Test

Data obtained by actual test on a natural flowing well[3] shows that as the flow bean opening is reduced the production rate is also reduced. The rate of decrease in production is about equal to the reduction in area of the opening through the flow bean. It can also be seen that as the flow bean size is decreased the amount of gas produced is very materially lessened up to a certain point. At this point the flow differential is such that the formation is practically resaturated as previously discussed. After this point is reached further reduction of bean size has but little effect on the amount of gas escaping with the oil.

A curve calculated from the gas and oil production curves clearly shows that there is a pressure at which the well can be operated to give maximum efficiency regarding the gas factor. This point may not give the best mechanical efficiency regarding the flow line, but it is the one which will allow the well to produce the greatest ultimate amount and the point at which the well should be operated regardless of flow-line efficiency.

As the formation gradually becomes depleted the pressure conditions change. This effect causes the low point of the gas factor curve to move to the left. Not enough data have been obtained to date to indicate the relationship between the working pressure and the rock pressure for the point of minimum gas factor. It is, however, assumed that for any particular well there is a definite relationship and that the point of maximum gas factor can be calculated at any time from the rock-pressure decline curve of the well. Work done on control and operation of gas wells shows this relationship to exist.

When a well, either flowing naturally or by gas lift, is put under pressure control the production rate for best results is reduced to 60 to 80 per cent of the open flow of the well. After the differential in the formation is decreased, due to the pressure imposed, the decline rate will be far less than that which will normally occur under open flow conditions. The amount of oil not produced after first applying back pressure, on account of the decreased rate, is soon regained by the flat decline existing after back pressure is applied.

Production Curves

Production curves of a typical well show:

Total oil produced from May 18, 1927 to August 22, 1927, 327.777 bbls.

Total gas produced, 199,004,000 cubic feet.

Average total gas factor, 612 cubic feet.

Oil produced before applying pressure control, 53,194 bbls.

Gas produced before applying pressure control, 42,118,000 cubic feet.

Average gas factor, 812 cubic feet.

Oil produced under pressure control, 274,583 bbls.

Gas produced under pressure control, 156,880,000 cubic feet.

Average gas factor, 569 cubic feet.

The pressure control is responsible for the reduction in gas factor from 812 to 569 cubic feet or 243 cubic feet for each barrel produced. At this rate the total amount of gas conserved by pressure control is 66,724,000 cubic feet. At 569 cubic feet per barrel this amount of gas is sufficient to produce 117,290 bbls. The cost of making this change in gas factor has been only the time required for making the study.

The total estimated increase in cumulative production to date is 42,400 bbls. The present daily open flow rate of the well is 3,400 bbls. The pressure control rate is 2,150 bbls. or 63.2 per cent of the open flow rate.

Will Increase Ultimate Production

The gas lift, properly applied and controlled, will increase the ultimate production of a well. If not properly handled, it will decrease the ultimate production. Proper handling consists principally, of the degree of skill practiced in maintaining back-pressure control on the formation.

Data for the production and gas-decline curves of a gas-lift well were started the day the well was placed on the gas lift. This would not flow naturally when drilled in but was swabbed through the 8¼-inch casing at the rate of 1,700 bbls. per day. Swabbing the well caused the collapse of the bull wheel shaft and other difficulties accompanying this method of production which made it uneconomical. The lowest possible back pressure was imposed on the well while it was being swabbed.

After the well was placed on the gas lift it started to decline regularly at the rate of about 6.5 bbls. per day, with an increasing natural gas factor and a declining working pressure. Although the decline on the gas lift was far less than that under natural flowing conditions it was considered too great. After the well had produced for about 2½ months the tubing pattern was changed which permitted a reduction in working pressure from 124 to 60 pounds. This large reduction in pressure was made possible by circulating more gas per barrel than had been previously used. At the same time the pressure was reduced in the flow line the back pressure on the formation was reduced.

Based on mechanical efficiency in the flow line as is general practice the efficiency of this well looks exceedingly poor, the output gas factor being about 3,500 cubic feet per barrel. In making the changes the net or natural gas factor was decreased from 500 to 175 cubic feet per barrel. In other words, the change permitted the well to produce with about one-third as much energy as had previously been used from the formation. It will be noted that while the production rate dropped after the change was made, its rate of decline became much less and in 12 days after the change was made the curve crossed the former decline curve and remained practically constant.

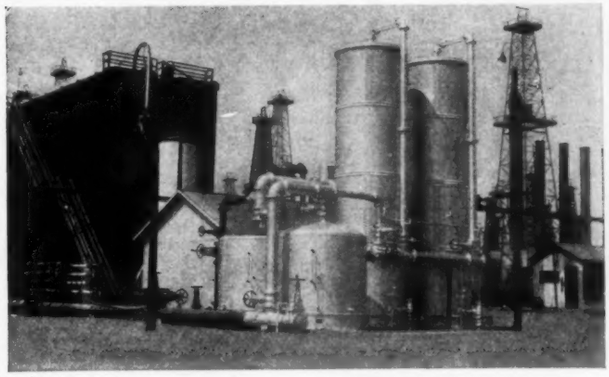
Only Expense Involved

The only expense involved in handling a well in this manner as compared to getting maximum efficiency from the flow line is the cost of compressing the gas circulated. When the production under "flow line efficiency" and "ultimate efficiency" is compared it can be seen that this added expense is very small compared to the increased returns from production.

In this particular well there was no increased cost on account of increased amount of gas circulated. When the tubing or flow line was changed to permit the larger volume the working pressures changed to the point where single instead of two-stage compression could be used. This permitted handling a larger volume with the same horsepower requirements, the cost being proportional to the horsepower used. In designing a gas lift installation it is advisable to choose a type of machinery that can readily be changed from two-stage to single stage when required.

By maintaining some back pressure on the well head the efficiency of the whole cycle is increased. Maintaining 15 pounds on the compressor intake doubles its capacity. The increased capacity permits

[3]Personal communication from K. C. Sclater.



A 25,000 gallon Campbell Plant at Alamitos Heights, Calif., installed for General Petroleum Corporation.

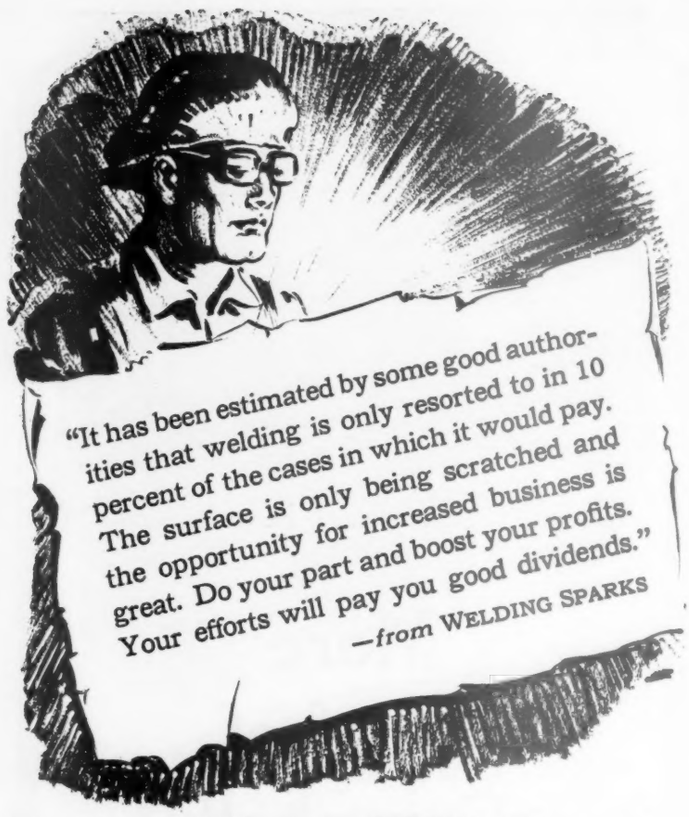
More Proof of Campbell Preference

As proof of recognition which Campbell plants have gained we cite the fact that 60% of all new natural gasoline plant construction in California during the past year was designed and installed by us. Of the remaining 40% our Absorbers were used in 75%. This record speaks for itself.

You'll be interested in our New Catalog.

J. A. Campbell
Consulting—Designing—Constructing
Natural Gas Engineer
P. O. Box 669 LONG BEACH, CALIF.

CAMPBELL
OIL FROTH
absorber


"It has been estimated by some good authorities that welding is only resorted to in 10 percent of the cases in which it would pay. The surface is only being scratched and the opportunity for increased business is great. Do your part and boost your profits. Your efforts will pay you good dividends."
—from WELDING SPARKS

Better Welds Will Boost Welding Business 90%

Welding is a comparatively new process. It is used today in *only* one place in ten where it could be profitably employed, according to authorities.

It is of vital importance to the industry to get this additional 90 per cent of business that logically belongs to it.

Nothing is more important than good workmanship in accomplishing this result. Our part, as we see it, is to furnish uniformly fine materials—materials that assure better welds every time.

That is the reason each Page Welding Wire or Electrode is plainly marked, carefully processed and then proved by an actual shop test. Prove Page quality for yourself. We'll gladly furnish samples.

PAGE STEEL AND WIRE COMPANY

Bridgeport Connecticut

An Associate Company of the American Chain Co., Incorporated

District Offices:

Chicago New York Pittsburgh San Francisco

PAGE-ARMCO PROCESSED Welding Wire and Electrodes

lifting the oil with higher back pressure than could otherwise be used and with the well head back-pressure permits the total differential pressure from the formation to the trap to be controlled. The working differential in the well referred to is but 38 pounds from the sand to the trap. The depth of the well is 2,500 feet and the size of the flow line is 5⅛-inch. This is considerably larger than the flow lines used in general practice for wells producing but 300 bbls. per day.

By proper handling of the gas in a gas-lift cycle the gravity of the oil may be raised and the amount lost by outage vapors decreased. On the well referred to the discharge from the trap is recycled through the compressor. The wet vapors or lighter hydrocarbons that were formerly escaping from the trap amounted to 5 per cent of the total production; when returned through the closed system they increased the production 20 bbls. and the gravity 3¾ degrees.

The gas lift can be very effectively used to increase the ultimate production of a field in which bottom water encroachment is encountered. Pressure and flow conditions may be so regulated that back pressures on the formation sufficient to hold down bottom water coning can be maintained allowing lateral drainage of oil above the water plant. This method of operation has been in successful use for the past year in the Panhandle. A well in this district, that made 100 per cent water in December, 1926, has averaged 590 bbls. of oil per day since that time[4]. The gas lift has also made economical recovery from wells producing as much as 90 per cent water. Some wells in this class produce as much as 2,500 bbls. of fluid with but 250 bbls. of oil. A pump cannot be made to handle this volume of fluid. Large-capacity pumps set in the casing by slips and packers and operated without tubing, however, being used for pumping large quantities very successfully.

Cleaning Out Wells

Wells operating on the gas lift seldom need cleaning out due to the steady flow conditions that prevail. This fact has been instrumental in the development of a new and successful clean out method, which involves the fundamental principles of the gas lift. The new method makes it possible to clean out deep pumping wells in approximately 5 to 10 per cent of the time previously required with a saving of $1,500 to $3,000 per job. The information thus gained from the gas lift has made it possible to increase the ultimate yield of pumping wells.

Conclusions

1. Where pressure conditions are suitable for using the gas lift the flow rate of wells thus producing can generally be increased over the rate which can be maintained by other means.

2. When the gas lift is used to increase the daily rate of a well, instead of being used as a means of back-pressure control, the ultimate production of a well will generally be decreased.

3. If the gas lift is used as a means of controlling the pressure on the formation the daily rate will be decreased but the well's ultimate production will be increased.

4. Gas lift is effective in increasing the ultimate production of a field under hydrostatic pressure where water has encroached into the oil-bearing formation.

5. Where offset wells are producing on the gas lift the best results and greatest ultimate recovery can be made when they are operated under similar conditions. An agreement as to pressure and rates should be reached by the operators. Trying to beat the offset generally works to the disadvantage of each.

6. To obtain the greatest ultimate yield from a well complete knowledge of pressures and volumes must be obtained. Proper equipment and supervision is the only way in which this can be done.

[4]E. O. Bennett and K. C. Sclater: Some New Aspects of the Gas Lift. Petroleum Development and Technology in 1926, 115.

AMERICAN ASSOCIATION CONSIDERS PROBLEMS

(Continued from Page 72)

use of the service by each class. He praised legislative and regulary bodies for intelligent co-operation and support.

Franklin S. Wade, vice president and general manager of the Southern Counties Gas Co. of California, agreed that the outstanding problem is improvement in rate schedules.

The dominating characteristic of the gas business now is stability, George B. Cortelyou, president of the Consolidated Gas Co. of New York, said, while B. J. Mullaney, vice president of the Peoples Gas Light & Coke Co. of Chicago, declared that prospects for continued prosperity of the industry were never better.

Heater and Refrigerator

A combination gas range and refrigerator, operated by gas, created a sensation at the opening of the $5,000,000 exhibit of appliances.

The new cooking and cooling unit takes up no more space than the average gas range. The refrigerator occupies the lower part of the unit, formerly given over to the oven, and the burners of the range constitute the top of the refrigerator. Officials of gas companies who viewed the new unit predicted it would revolutionize gas appliance design and would probably be the forerunner of other combination units in line with kitchenettes and small kitchens.

The business of producing manufactured gas in the future will be a minor department of a great industry vertically integrated, beginning with coal in the ground, and oil which is merely another form of it, and ending with motor fuels, dyes, medicines and explosives, Philip Cabot, Harvard School of Business Administration, declared.

Four Industries in One

The gas industry's future is perhaps the most brilliant of any in the public utility group, Mr. Cabot said, and the average man, and even the average investor, is aware of it.

The gas industry of tomorrow, he continued, will open up a career essentially different from that of the present public utility man, for it will be freed from government price regulation, by which timid men are daunted, and will bring in not only the problems of balancing scales in many domestic markets but also those of international markets.

Four Industries in One

"Today we have no standing in the foreign markets for coloring and dye stuffs, but with our unequalled command of capital and our home market which enables us to get into quantity production at one stride, we need not fear the competition of any other nation if only our native ability is adequate to the task," he explained.

"The production of gas as now carried on is not one industry but four," Mr. Cabot stated. "What we call the gas business consists in the production, actual or potential, of gas, coke, tar and ammonia, and motor fuels. At least 75 per cent of the business is outside the public utility field and will remain so.

"Gas men refer to gas as their main product, and coke, tar and ammonia as their by-product because they are gas men, but the fuel merchant, coke is the main product, the gas often being pure waste, while to the manufacturing chemist the coal tar offers a field of activity and economic development which overshadows all other products of the coal. In the production and marketing of the coal tar derivatives we have so far been very backward but they contain a future inseparable from the development of the gas industry and may perhaps become the dominant factor of it."

After describing the world-wide tendency of population to gravitate into cities, Mr. Cabot said the most pressing problem is the elimination of the smoke nuisance. When this enemy is attacked, he said, the burning or raw bituminous coal will be forbidden and the gas industry will be forced to provide for a large

percentage of this market by a supply of gas or coke.

Oil Not Competitor

"I am aware that there are those who believe that fuel oil will be a sharp competitor in the whole industrial and heating field," he declared, "but in view of our very limited domestic supply and the ravenous appetite of the automotive market for gasoline, to say nothing of the marine demand for fuel oil, he would be a bold man who would back oil as a serious competitor of gas for metropolitan heating and industrial use.

"Here is a nearly virgin field where the genius of the merchant can operate unhampered by the traditions and errors of the past and where the deadening effect of government regulation will be at a minimum because it is so clearly competitive."

Engineers attending the technical sessions announced that probably the most significant trend of the past year in the gas industry has been the rapid growth of gas for house heating.

This comparatively new venture for manufactured gas companies, they said, has shown such remarkable growth that now there are more than 120,000 homes using this fuel for heating, while there are more than 1,300.000 homes using natural gas. One hundred and fifty-six manufactured gas companies report house heating installations as compared with 71 a year ago, and in addition more than 50 other companies are about to merchandise this use for gas.

Manufactured gas companies reporting both in 1926 and 1927 show a 9 per cent increase in house heating installations, according to H. Leigh Whitelaw, of New York. In the New England states the number of installations has increased from 1,308 to 2,600 in one year.

"Estimates show that when 5 per cent of our customers use gas for heating their homes, gas sales will increase 50 per cent," Mr. Whitelaw said. Mr. Whitelaw declared that in selling gas for this purpose the companies have a powerful friend in the public, which is weary of periodic coal strikes and fearful of oil because of predicted shortages.

H. J. Struth, petroleum economist, announced that 51 per cent of all natural gas used by domestic customers is for home heating.

Fogg Elected President

Officers for the coming year were elected. Oscar H. Fogg, vice president of the Consolidated Gas Co. of New York, was named president, succeeding Mr. MacBeth, who completed a one-year term. Bernard J. Mullaney, vice president of the Peoples Gas, Light & Coke Co., Chicago, was named vice president. Clifford E. Paige, vice president of the Brooklyn Union Gas Co., was re-elected treasurer.

CENTRAL WEST

(Continued from Page 66)

31, Gilmer Township, Adams County, proved a duster at a depth of 850 feet. This test is in the extreme western part of Illinois and not far from the Mississippi River, southwest of the McDonough County Field, where several years ago a large number of wells were drilled near Colmar. Adams County lies just south of Hancock County, which also borders on the Mississippi River, Quincy being the county seat of Adams County.

Central Ohio

Very little was accomplished in the Central Ohio Field since the last report. In Richland Township, Holmes County, the Kemrow Co.'s test, 660 feet from the south and west lines of the Frank Ledbetter 39 acres, Lot 17, developed into a fine gas producer.

In Monroe Township, Coshocton County, the Empire Gas & Fuel Co.'s test, 572 feet from the north line and 476 from the west line of the H. A. Brush 40 acres, Lot 11, developed into a duster.

In the Cleveland Field, Strongville Township, Cuyahoga County, the Empire Gas & Fue Co. drilled in a fair gas well on the William C. Whitney property, in the NE of Lot 32.

In the Chatham Field, of Chatham Township, Medina County, the E. R. Edson & Sun Co.'s Nos. 31 and 32 on the W. P. Wertz farm, in Lot 14, Section 5, are reported good for 2 bbls. each at a depth close around 380 feet, being very shallow territory.

Michigan

More quietude in drilling operations prevails in the Saginaw Field proper than at any time during the past year and a half, the interest being shifted to a dozen or more companies where wildcat wells are being drilled or making ready to start.

The latest development of Michigan oil resources comes from the extreme southwestern part of the State and appears to have been kept very quiet. This test is on the A. D. Vought, 2 miles south of Decatur in the extreme southern part of Van Buren County, Michigan; north of Cassopolis, southwest of Kalamazoo, tand being drilled by the Wert Oil & Gas Co. of Indian Harbor, Ind. At a depth of 962 feet a showing of dark oil was found, and while only in small quantity, it is encouraging and the well will be drilled deeper in hopes of encountering a commercial well.

In the drilling of this well to its present depth, at 150 feet it gushed forth water and at 160 feet a slight skim of oil was noticeable on the water. At around 400 feet mineral water was found which the land owner believes might be valuable is kept apart from the oil. The tentative plan is to drill at least to a depth of 1,025 feet. This is directly south of Allegan County, where, some 25 or so years ago, a well was drilled that was estimated at 15 bbls., and there are possibilities of the opening of a new field somewhere in these two counties. It is south of this that the South Bend people are planning to sink three tests, though nearer the Michigan-Indiana state line. The drilling on this well started on April 8 but was shut down for several weeks. The well is located at the foot of Fifield Hill, and the farmer is said to have great faith in that area on account of seepages in the lowlands of oil scum on the water, which has been noticeable for the past 15 years. The contract work is being done by Robert H. Kersey of Indiana.

Completions

In the Saginaw Field proper, the Wells-Schmidt Co.'s No. 5 on the Whittier property on the east side of the Saginaw River, struck top of Berea sand at 1,812 feet and went 17 feet in the sand and given a shot, is showing for 20 bbls.

Wickes Brothers' No. 3 on their own property at Carroll and Waters Street, also on the east side of the river, got top of Berea at 1,812 feet, and also showing for 20 bbls. initial.

Saginaw Prospecting Co.'s No. 5 on the Eddy estate, on the west side of the Saginaw River, south of Davenport Street, got top of Berea at 1,808 feet and went 18 feet in the same, and shot is showing for from 20 to 25 bbls. initial.

Field News

The next few days should see the completion of Vrowley & Carr's well on Phelon Street, between Park Avenue and Ward Street. This is a test in advance production on city property.

The Sun Oil Co. is nearing pay dirt in three of its drilling wells. They are No. 4 on the Pere Marquette right of way; No. 4 George Kuck farm, Section 10, Saginaw Township, and No. 5 on the Louis Voight farm, in the SE of the same section

Advise from the Ashley Field, in Gratiot County, is that the Sun Oil Co.'s test on the Anderson farm, passed through the Berea sand without a showing of oil, the top of that formation being found at 2,039 feet, and it is expected to make a further test of the lower stratum, the Saginaw sand.

WEST TEXAS GEOLOGISTS

The West Texas Geological Society held its October meeting in Abilene by invitation of members in that city. It is usually held in San Angelo. Tom F. Newman, geologist for the Midwest Exploration Co. at Abilene, presided in the absence of Dr. H. P. Bybee of the Dixie Oil Co., president of the society, who was unable to attend. W. H. Whittier, district geologist for the Roxana Petroleum Corp. at Abilene, read a paper on the correlation of the producing horizon in the new Runnels County discovery well.

Umbrella Roof Tanks, Amarillo, Texas

Steel Storage Tanks

Any Size from 75 gallons to 80,000 barrels.

Erected Anywhere by trained Pittsburgh-Des Moines field crews.

Promptly because tanks of standard design are carried in stock, completely fabricated and ready for immediate shipment, at both Pittsburgh-Des Moines shops.

Send for designs and estimates of the tanks you need. In addition to our standards in stock, we have plans and materials on hand for tanks of all capacities. Special tanks of any shape for any purpose will be designed and built to meet your requirements.

We will gladly send an engineer to discuss your plans with you whenever you are in the market for storage tanks or steel plate work. For over thirty years we have specialized in this line of work; with this wide and varied experience we are ready to handle any tank problems you may present.

Write, phone or wire the nearest Pittsburgh-Des Moines office for prices on the tanks you need.

Send for our Oil Tank Catalog No. 11.

Pittsburgh-Des Moines Steel Company

1227 Praetorian Building, Dallas

613 Professional Bldg., Pittsburgh, Pa.

915 Tuttle St., Des Moines, Ia.

New York

San Francisco

Atlanta

Chicago

REPUBLIC

Each Piece of Republic Pipe Is Carefully Inspected

Both ends of each length of Republic Pipe are checked for size. The plain end line pipe passing over the inspection table shown above is part of an order for 24 miles of 12¾" O.D. shipped to the Latex Construction Company for service in Louisiana.

Tubing—
Casing—
Line—
Drive—
Rotary
Drill
Pipe

Write for quotations

REPUBLIC IRON & STEEL COMPANY

GENERAL OFFICES: REPUBLIC BLDG., YOUNGSTOWN, OHIO

SALES OFFICES: Boston New York Philadelphia Detroit Birmingham St. Louis San Francisco Cincinnati Chicago Pittsburgh Dallas Denver Buffalo Cleveland El Paso

EASTERN FIELDS

(Continued from Page 68)

has drilled through the Berea grit a second test on the B. B. Nester farm. It is a duster. On Indian Creek, same district, Park Bowser has a gasser in the salt sand at a test on the J. W. Grimm farm.

In Center district, Wetzel County, the Hope Natural Gas Co.'s second test, on the J. K. Long farm, is a gasser in the fourth sand. In Liberty district, Marshall County, the Decem Development Co. has a very light showing of oil in the Gordon sand at No. 8 on the Robert M. Bonar farm.

Monongalia County

In Clay district, Monongalia County, the Philadelphia Co.'s test, on the G. T. Moore farm, drilled deeper, is a gasser in the fifth sand. In the same district, the Carnegie Natural Gas Co. drilled deeper No. 3 on the R. W. Sine farm. It is a gasser in the stray sand at a total depth of 3,315 feet. In Paw Paw district, Marion County, the Owens Bottle & Machine Co. has a fifth sand gasser at a test on the W. H. Hibb farm.

In Sheridan district, Calhoun County, the Chemical Gas Co. has a gasser in the Maxon sand at a test on the E. T. and H. L. Snyder farm. In Lee district, H. C. Simmons has a 5-bbl. pumper in the Big Injun sand on the Alonzo Powell farm. In Sherman district, the Hope Natural Gas Co. has a duster on the Parsons farm.

In Duval district, Lincoln County, S. V. Reishman has a gasser in the Berea grit at a test on the D. H. Behler farm. On Sycamore Creek, Sherman district, Calhoun County, the Sycamore Supply Co.'s test, on the L. J. Morris farm, is good for 10 bbls. a day in the Big Injun sand.

Keith Thompson has completed in the Peeker sand his test on the Myra K. Smith farm, in Washington district, Pleasants County. It is good for 10 bbls. a day. In Jefferson district, Dinsmoor & Co.'s test, on the Henry Severns farm, an old well drilled down, is dry in all sands. It has been abandoned.

Ritchie County

Smith Whan has completed No. 4 on the Charles Wolf farm, in Murphy district, Ritchie County. It is a gasser in the Big Injun sand. In Grant district, Robert Rinehart has a gasser in the salt sand at his test on the O. C. Thomas farm. In the same district, the Freehold Oil & Gas Co. has a gasser in the Maxon sand at No. 6 on the J. E. Hannan farm.

On McFarlan Creek, Murphy district, Ritchie County, the South Penn Oil Co.'s No. 9 on the Anna M. Wilson farm is through the gas sand and still drilling. It is producing 4 bbls. and an increase is expected when drilled to the Big Injun sand. In Jefferson district, Pleasants County, the Bailey Gas Co. is drilling a test on the Lafayette Pethtel farm.

In some sections of West Virginia there is still some test work starting, located for the most part in defined territory. Gilmer, Calhoun and Clay Counties have more of this work than any others in the "Little Mountain State."

In Center district, Gilmer County, the Chartiers Oil Co. has started to drill a second test on the G. D. Stump farm. In Reedy district, Roane County, the Heck Oil Co. has shut down at its test on the F. D. Vandale farm. In Center district, Wetzel County, the Carnegie Natural Gas Co. is drilling deeper its old No. 1 on the F. M. Wade farm and is due in the Gordon sand.

Calhoun County

In Lee district, Calhoun County, McCall & Co. have started to drill on the Millie Laughlin farm. In the same district, the United Carbon Co. has part of the rig material at a location on the D. G. Craddock farm. The location has been made for a second test on the same farm. In Sherman district, W. H. Bickel is rigging up on the Michael Knight farm. In Sherman and Lee districts, Godfrey L. Cabot has made locations on the L. H. Booher and S. J. Farrell farms.

In DeKalb district, Gilmer County, Satterfield & Co. are due in the sand on the Robert E. Davis farm. In Harper district, Roane County, the Producers Oil & Gas Co. is drilling on the David I. Homer farm. In Spencer district, Godfrey L. Cabot is due in the Big Injun sand on the Emma Hildreth farm. In Sheridan district, the Penn Royal Oil Co. is drilling deeper its test on the Taylor heirs' farm.

Drilling Test Wells

On Big Laurel Creek, Union district, Clay County, D. H. Stephenson has the rig completed and started to drill a second test on the Otto Bowman farm. The well is 2 miles southeast of the Rouser Oil Co.'s test on the Davenport-Reed farm. On McFarlan Creek, Murphy district, Ritchie County, J. M. Deem and others are spudding in on the Joseph Tingler farm. In Grant district, Cabell County, the Aetna Oil & Gas Co. is fishing at 920 feet on the Herbert Hatfield farm. In Carroll district, Lincoln County, W. C. Kingery has started to drill another test on his own farm. In Union district, Roy & McComas have shut down for orders on the Randolph Sias farm.

In Grant district, Wetzel County, J. E. Snyder and others have started to drill a test on the J. E. Snyder farm. In Union district, Ritchie County, Clark Braden and others have the rig completed on the F. E. Pritchard farm. In the same district, L. Akin & Co. have the rig completed for another test on the Ira D. Cox farm. On Frozen Camp Run, 3 miles west of the Virginian Gasoline & Oil Co.'s test on the Martha J. McCreedy farm, in Jackson County, Ravenwood district, the Hope Natural Gas Co. has the rig completed and drilling tools on location at a test on the L. D. Parsons farm. On Tanners Run, DeKalb district, Gilmer County, the Hope Construction & Refining Co. is drilling deeper No. 3 on the Drusilla Hardman farm.

In Battells district, Monongalia County, the Manufacturers Light & Heat Co. has started to drill on the Laura B. Tennant farm. In Clay district, Wetzel County, the Wetzel Gas Co. is building a rig on the W. H. Kimble farm. In McClelland district, Doddridge County, J. H. Pentz has started to drill a second test on the William Underwood farm. In DeKalb district, Gilmer County, the Hope Natural Gas Co. is rigging up on the Homer Carr farm. The Philadelphia Gas Co. has started to drill on the S. B. Cook farm, in Birch district, Braxton County. In the same district, the same company has the road made to a location on the Elk Valley Lumber Co.'s tract. In Lee district, Calhoun County, Smith & Starcher have started to drill on the C. W. Starcher farm.

Southwest Pennsylvania

Near Groveton, Robinson Township, Allegheny County, local parties have drilled in a test well on the Getty farm. They ran into a pocket of gas that caught fire from the forge and consumed the drilling machine.

KENTUCKY-TENNESSEE

(Continued from Page 68)

between Sunnydale, Westerfield and Pleasant Ridge.

In this territory, the most important at present in western Kentucky, the course of the Bells Run anticline is indicated by red structural contours on a black geological base. Actual drilled wells and pipe lines are also shown in red. The map was prepared by W. C. Eyl under the direction of Dr. W. R. Jillson, state geologist. It is correct as regards development up to August, 1927, and is presented at the scale of 1 inch to 1 mile. Coupled with it are detailed structural sections across the Ambrose Pool, based upon casing head elevations and actual well records.

Week's Work

The summary of the week's work in the Kentucky-Tennessee Field shows 27 completions, 18 producers with an initial production of 1,300 bbls., 8 dry holes and 1 gas well. Compared with the previous week, there were 1 less completion, 3 more producers, 758 bbls. more produc-

tion, 4 less dry holes and the same number of gas wells. The wells were distributed by counties and districts as follows:

County—	Oil Comp.	Wells	Prod.	Dry	Gas
Ohio	13	10	975	3	0
Barren	10	5	71	5	0
Daviess	1	1	10	0	0
Metcalf	1	0	0	0	1
Ttl. Kent'ky	25	16	1,056	8	1
Tennessee, Clay County.	2	2	244	0	0
Total	27	18	1,300	8	1
Last week	28	15	542	12	1
Difference	1	3	758	4	0

Pipe Line Runs

According to the three pipe line companies handling crude in Kentucky that make their monthly reports, there was a total of 513,704.25 bbls. handled through the three systems during September. The runs from the eastern division totaled 285,108.49 bbls. for the five-week period from August 27 to October 1. The western division runs totaled 228,595.76 bbls., which does not include the runs of the Stoll Oil Refining Co., from the Barren County Field.

The runs of the Cumberland Pipe Line Co. for September amounted to 285,108.49 bbls. The runs for the week ending September 3, were 58,497.72 bbls.; week ending September 10, 55,494.63 bbls.; week ending September 17, 55 991.07 bbls.; week ending September 24, 53,-242.60 bbls.; week ending October 1, 61,-882.47 bbls.

The Illinois Pipe Line Co. handled through its western Kentucky lines a total of 206,444.97 bbls.; a gain over August runs of 8,005.55 bbls. The September runs of this company were 113,-722.76 bbls. greater than the January total runs, showing what an increase has been made in production in the western division, which is due to the big producers found in the Ohio County Field.

The Paragon Development Co.'s runs for September from Barren County amounted to 18,529.48 bbls., and from Cumberland, Monroe and Clinton Counties, 3,621.31 bbls., or a total of 22,-150.79 bbls.

The Paragon Development Co. ran during September from Clay County, Tennessee, fields a total of 2,664.74 bbls., and from Pickett County, 786.14 bbls., making this company's total runs from the two States for September of 25,-601.67 bbls., a decrease from the August runs of 5,770.75 bbls.

Western Division

While the eastern division failed to report any completion during the week, it was up to the western division to make a showing of some value and it did with five large completions, three in the Ambrose Pool and two in the Sunnydale Pool, and all in Ohio County.

Ohio County

Field work is still going strong in Ohio County, as there is now a supply of water for drilling purposes and results are above expectations. The runs from the field are not as heavy as recently owing to the fact that the wells are being pumped only during day time instead of a steady 24-hour pumping, the production running close to 5,000 bbls. This change in pumping is done according to operators on account of the crude prices over the country at this time. Leasing activities are noticeable in all parts of Ohio County and many new people are entering the field in hopes of getting a foothold and secure some of the good things that are passing around in the way of above-average oil wells.

In the Ambrose Pool, the Wood Oil Co.'s No. 18, on the Mary J. Elmore 100-acre farm, a string of 699 feet of casing was set, sand found at from 699 751 feet and drilled to a total depth of 756 feet and shot with 200 quarts, and produced 200 bbls. the first 24 hours. Nos. 19 and 20 are under way on the same lease.

Creek Drilling Co.'s No. 11, on the Fannie Lake 100 acres, is also a 200-bbl. initial producer. A string of 700 feet of casing was set in this hole, sand being found from 702-48 feet and sent to a total depth of 760 feet and shot with 180 quarts.

Daugherty and others' No. 5 on the Cora Wells 130 acres, in the western extension of the Ambrose Pool, came in with an initial production of 200 bbls. In this well a string of 638 feet of casing was set, sand at from 627-70 feet, and drilled to a total depth of 684 feet and shot with 140 quarts.

West of the Ambrose Pool, Bolling and others' second test on the Joe Chapman 50 acres, is reported a dry hole, as is the test on the Jewell farm, drilled by Ferdinand Heine.

Gourney Development Co.'s No. 1, on the J. S. Bartlett 10 acres, is reported showing for around 15 bbls., although reported by some as much larger.

The Bells Run area is showing some interest and a considerable development is looked for in the near future. In this area, the Leeper Oil Co.'s test on the Wilbur King farm is showing for better than 10 bbls. French and others are drilling No. 1 on the Ben Taylor farm, just west of Bells Run. The Loulex Oil Co. is drilling on the Elijah King property in the town of Bells Run.

In the Midkiff Pool, the Penn-Indiana Oil Co.'s No. 5 C. A. Kelly farm is reported at 20 bbls. No. 6 on this lease cased at 433 feet, having passed through a stray sand at from 380-418 feet, getting the top of the Jett sand at 433 feet and bottom of the Jett at 457 feet and drilled 5 feet below and shot with 90 quarts, the first 24 hours' production amounting to 60 bbls.

In the Sunnydale Field, southeast of the Ambrose Pool, the White Plains Oil & Gas Co. drilled a dry hole at a test on the J. H. Dodson farm, at a depth of 751 feet.

In the same field, Earl Patton's No. 3 on the Mary E. Wilson 174-acre farm, set a string of 414 feet of casing, found sand at from 434-50 feet and shot with 50 quarts, the initial production being 100 bbls.

In the Midkiff Pool, the White Plains Oil & Gas Co. set a string of 411 feet of casing in No. 5 on the Howard heirs' farm. Sand was topped at 433 feet and bottom of sand at 446 feet and shot with 60 quarts, the initial production being 20 bbls.

In the Sunnydale Field of Ohio County, the Wood Oil Co. set a string of 372½ feet in its second test on the J. C. Smith 151-acre farm, found sand from 372½-95 feet and drilled to a total depth of 421 feet, and was shot with 60 quarts, the well's initial production being 150 bbls. It is the best well as yet reported from the new pool.

Barren County

In the Glasgow Field of Barren County, in the Emery-Moore Pool, Fred C. Moore's test on the Hayden Myers farm, is reported a 5-bbl. pumper, while Phil Kopel's second venture on the Reeves farm, proved a duster.

In the Haywood district, Ogle and others' No. 3 Christ Ellis farm, is a 6-bbl. pumper, and J. G. Esslinger's test on the Pulliam farm was dry. The latter well being in the Wisdom Pool.

In the Lecta Pool and its extensions, the Samson Oil Co.'s Nos. 4 and 5 on the Loden farm, are 20 bbl. initial producers. Hunt, Leach and Mitchell have one of the same production at No. 2 on the W. Browning farm. J. G. Esslinger drilled a dry hole in a test on the Gooden farm, and J. D. White got a duster at a second test on the Burks farm. Sandals and others' test, on the Shirley farm, was also a duster.

F. L. Esslinger is working at a test on the Henderson farm, near the town of Lucas. In the old Oskamp Pool, Langston and others are drilling Nos. 1 and 2 on the Browning farm. Wood Oil Co. is drilling No. 4 U. M. Smith farm, offsetting No. 3 on the Christ Ellis farm, owned by Ogle and others.

Field Notes

A mile or so northeast of the Roby Pool, in Daviess County, Thompson and others' test, on the Mattingley farm, is reported showing for a 10-bbl. pumper.

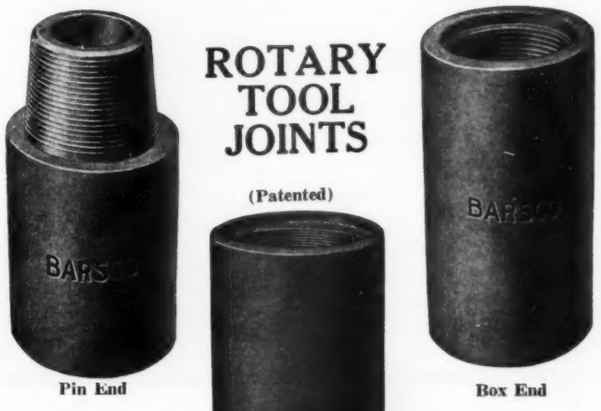
In Metcalf County, Sampson, Davis and Mitchell drilled a test on the Price farm to a total depth of 1,200 feet. A nice gas showing was found at 270 feet but when drilled deeper failed to show any sand below the black shale.

Frank P. Russell, Louisville oil op-

This is another of a series on specifications—keep for reference in ordering.

BARSCO PRODUCTS

for Oil and Gas Well Drilling



Forged Steel — The "pin" is tempered to a special specification and hardened to withstand the most severe usage.

Construction — The *forged steel* from which this joint is built has a tensile strength of from 90,000 to 110,000 pounds.

Size Pipe, Inches	Length, Inches	O. D. of Joint, Inches	Size of Taper, Inches	No. of Threads, per Inch	Weight, Pounds
2½	15	3 11/16	2 x3	5	45
3	15	4¼	2¼x3¼	5	55
4	18	5¾	3½x4½	5	70
4	20	5¾	3½x4½	5	75
6	18	7¾	5 x6	4	130
6	20	7¾	5 x6	4	155
6	24	7¾	5 x6	4	175

Joints of other sizes, length or thread other than specified above can be furnished. When ordering, state make, size and weight of rotary pipe on which tool joint is to be used.

Stocks carried by Dealers.

BARTLESVILLE SUPPLY COMPANY of Missouri
3400 MAURY AVENUE—ST. LOUIS, MISSOURI
Texas Warehouse—J. G. Lockard, 504 Western Ave., Amarillo, Texas
Export Office: 150 Broadway, New York City
Manufacturer's Representatives

B. & A. Specialty Co., Tulsa, Okla.
Miller Tank & Supply Co., Casper, Wyo.

—Write for Complete Catalog

Twice the Service or money back

We guarantee the No-Co-Ro Drop and Seat to serve you longer than any two balls and seats you have ever used in your pumping wells—because we know that they have outlasted as many as *three dozen* balls and seats.

DROPS and seats are made of No-Co-Ro, a non-corrosive alloy so hard that few shops would attempt to machine it. They will not pit or corrode, even under the most severe acid conditions.

DROPS and seats embody an entirely different principle in valve check design. Rattle and flutter, so common to balls and seats, are eliminated. A much longer life, with a consequent saving in pulling and replacement costs, is the result.

Test No-Co-Ro DROPS and seats in your most troublesome well, and you'll soon be using them in all your pumping wells—another recruit in our army of satisfied users.

NORRIS BROTHERS, Inc.

Robinson, Illinois **Fort Worth, Texas**

P. S. Don't forget that the No-Co-Ro Ball and Seat is the only one made of No-Co-Ro. We guarantee it to outlast any two ordinary balls or seats you have ever used.

erator, has sold his Burton Brothers lease on the Gainesville Pike, about 8 miles northeast of Scottsville, in Allen County, to J. B. Tiger and others of Chattanooga, Tenn. The deal involves 100 acres considered to be one of the best oil leases in that part of Allen County. The consideration was not disclosed.

Mayor H. E. Dixon, Scottsville oil operator, bought from E. M. Treat & Co., of Pittsburgh, Pa., by long distance telephone, the 52-acre tract of the Duncan lease in western Allen County, where Mr. Dixon has extensive holdings.

Thompson & Bartlett, Scottsville oil operators, report a fine showing in their well on the Bill Dodson farm, in the Gainesboro Field, of Jackson County, Tennessee.

The Franklin, Ky., Favorite has this to say: "Repp & Roby, who own the lease of the Gant gas well, 1½ miles east of Franklin, are laying mains preparatory to supplying about 50 families on East Cedar Street, with gas for heating and cooking purposes. This well was drilled during the development in the Simpson County area some years ago, and when gas was found it was plugged. Mr. Repp finally secured a lease from the heirs of the Gant estate and recently interested E. S. Roby in the movement to supply gas to patrons. The understanding is that the firm intends to drill other wells later and eventually supply the city of Franklin as a whole."

Tennessee

In the Celina Field of Clay County, Tennessee, E. G. Brandenburg and others' well, on the Holmes farm, was drilled 18 feet deeper and reported making 6 bbls. per hour. No. 3, in the Fox Springs Pool, was drilled 35 feet deeper and is making 100 bbls. initially.

No. 1, on the Rich farm, drilling by H. Z. Clark, has tapped the sand and is making an excellent showing. Deeper drilling will not be done until storage facilities are on the ground. This well is in the Mill Creek area.

It is said that the Ohio Oil Co. has close to 3,000 bbls. of crude above ground in storage, in Clay County, with no present outlet for the storage oil. The Paragon Development Co. has a gathering line in the field and probably a gathering line will be laid to the Ohio company's holdings.

NEW PETROLEUM MANUAL HAS MUCH INFORMATION

The "Oil and Petroleum Manual," for 1927 (eighteenth annual issue) by Walter E. Skinner, has been issued. Covering 430 pages it contains particulars of 610 companies, producers, refiners, carriers—pipe and steamship—and oil. finance companies operating in all parts of the world. Special attention has been directed to the principal American and foreign companies. Lists are also given of the officials connected with the companies and comprise 2,103 directors, 316 secretaries, and 180 consulting engineers, managers, agents, etc., their names and addresses and company connections.

The particulars of each company include the directors and other officials, date established, location of property, purchase consideration, number of wells sunk, oil production, and description of work in progress, capital, if offered to the public, calls dividends and financial position as disclosed by accounts, also highest and lowest prices of the shares for the last three years and latest price.

A table showing the monthly production of the principal companies known on the London Stock Exchange for 13 months ended April 30, 1927, is also given together with the world's annual production of petroleum since 1918 from the principal contributing countries. Other useful features are a glossary of technical terms by the use of which developments can easily be followed; liquidation list of 825 oil companies by which obsolete securities can quickly be traced and a directory of manufacturers and exporters of oil field equipment and a list of brands of petroleum products marketed by the companies appearing in the book. The book is published by Walter E. Skinner, 15, Dowgate Hill, Cannon Street, London, E. C. 4.

GAS FACTOR AND PRODUCTION EFFICIENCY

(Continued from Page 138)

necessary to accomplish its translation, and thus will influence to an important degree, the magnitude of the gas factor. Flow resistance is a function of the sand permeability, which in turn depends upon the size of sand pores, texture of the mineral grain surfaces, and viscosity and surface tension of the oil. The rate of flow and distance traversed are also factors of importance in determining the sand resistance.

3. Release of gas from solution in the oil, resulting in the formation of minute gas bubbles which remain occluded in the oil within the sand pores, has an important influence in increasing the sand resistance to flow. For this reason, the energy necessary to cause flow, and the gas factor, are increased as the pressure declines and the gas is released from solution in the oil. The resistance to flow is further increased as the occluded gas bubbles grow in size with continued release of pressure.

4. Advancing age of the wells, with attendant growth in the extent of oil-drained channels within the reservoir sand, promotes channeling of the gas from points remote from the wells, without comparable movement of the oil. Such oil as is produced is therefore accompanied by a greater quantity of gas than during the early period of development when gas channeling is not a factor of such great importance.

5. Close spacing of wells also promotes channeling of gas with a resulting high gas factor. Rapidity of production which results from crowding of wells leads to high gas-energy consumption and a higher gas factor than would be possible with properly spaced wells. Each additional well drilled within oil-drainage radius of other wells, is a gas liability and leads to a reduction in ultimate oil recovery.

6. The method of production and technic of well control have an important influence in determining the gas factor, occasioned chiefly by the extent to which the formational gas is relieved of the necessity of lifting the oil to the surface, and the precautions taken to prevent channeling of the gas in the vicinity of the wells. In this regard, free-flowing wells are least efficient, gas-lift wells are more efficient and pumping wells most efficient. It is important that the well be tubed to a suitable depth, irrespective of the method of production employed.

7. Application of back pressure to producing wells, provides a means of reducing the gas factor by reducing the rate of flow of fluids in the reservoir sand, and minimizing growth of the occluded gas bubbles within the oil as they approach the wells. For any given set of conditions, there is a certain back pressure which if maintained, will result in maximum ultimate recovery of oil. Either higher or lower back pressures will result in decrease in the ultimate recovery. This most efficient back pressure is not constant throughout the life of the well, but decreases as the formation pressure and rate of production decreases.

8. The most efficient back pressure and gas factor from the standpoint of ultimate recovery, are not usually those which are productive of maximum ultimate profit to the producer. The "economic gas factor" is one which must be arrived at by a proper balancing of considerations which determine the financial profit to the producer with considerations of conservation of oil resources in the public interest. The selling price of petroleum will determine how far the producer may go in meeting the conservation issue.

9. Efficiency in the use of gas energy in oil production depends primarily on proper spacing of wells, timeliness of development, maintenance of a suitable rate of production and the use of production methods which will utilize as large a part of the expulsive energy of the gas as may be possible, in forcing oil through the reservoir sands into the wells.

CALIFORNIA FIELDS

(Continued from Page 64)

with an 8⅝-inch oil string carrying 270 feet of perforated. As a rule, new wells on the Kern front average between 100 and 200 bbls. daily upon completion and for this reason the General Petroleum's No. 13 Sill is of more than ordinary interest. The St. Helens Petroleum, however, still holds the distinction of bringing in the largest completion on the front, as its No. 1 in Section 26-28-27, made 465 bbls. initially when finished last month. On the Young lease the General Petroleum brought in No. 14 as a 172-bbl. pumper from 2,125 feet and this well should be followed into production by another within a few days. The Petroleum Securities increased its list of producers by completing No. 1-B in Section 22-28-27, and incidentally increased its daily production 105 bbls. the hole in question having been finished at 2,475 feet. George F. Getty is drilling his last well on the Tegeler lease in Section 22-28-27 and will probably concentrate future work on the Grady property in Section 26-28-27.

Drilling operations in the Mount Poso Field showed no change during the week but in the Round Mountain district to the east preparations are under way to start several new holes in the near future. Four 750-bbl. steel tanks are in course of construction and with the laying of 1,000 feet of gathering lines the Elbe Oil Co. will get under way in earnest. Within a few days this company will spud in two new wells in Section 18-29-28 and another on the Jewett property in Section 29-29-28. There is no particular demand for this heavy oil on the part of refiners and in the absence of adequate pipe line facilities it is obvious that the Elbe's new work is the result of lease obligations. One of the most interesting developments in this region during the past two weeks was the surveying of a route for a new county road which will link together the Round Mountain, Mount Poso and Kern River fields. The Chamber of Mines & Oil is primarily responsible for the building of this road as that organization stressed the necessity of immediate construction in order to facilitate development work in getting under way in those fields.

Northern California Wildcats

Recent developments in the Seacliff district west of the prolific Ventura Avenue Field indicate the possibility that a new producing area may actually be opened up at this point in the very near future. The Pan American's No. 1 State, located within a stone's throw of the Pacific Ocean, has enough sand actually proven up to almost guarantee production although the well is not showing as much kick as might be desired. The Chanslor-Canfield Midway Oil Co., which pioneered this area, has had oil in both of its Hobson wells for some time and No. 1-A will be put on a production test in the near future. The General Petroleum will probably drill at least two wells within a short time after the completion of the first successful commercial producer in this area and the Associated will also follow suit by starting early work on the Dunshee ranch aggregating 130 acres. The Shell recently leased the remaining 435 acres of the Dunshee property and at least one well will be drilled on this and the Maynard lease which the company also has tied up.

The Pacific Eastern's Union Avenue wildcat in Kern County is still in an unsatisfactory condition as far as the development of commercial production is concerned and it would not be at all surprising if an additional hole was started soon as the formation in this test appears to be pretty well mudded off as a result of the strenuous efforts necessary in keeping the well under control during the early stages of drilling. Interest in the Edison district, south of Bakersfield, is still at fever heat and both the Union and Standard acquired protective holdings in this locality during the week. The former tied up 640 acres in Section 12-29-29 for a cash bonus of $16,000, while the latter paid $9,600 for 480 acres in Section 33-28-29. The Superior has also been quite active in this area, having tied up several hundred acres during the past 30 days. The showing found by the General Petroleum in its No. 1 Kerwin has stimulated interest in the possibilities of the Edison district and leasing as a result has remained quite active.

Southern California Wildcats

The Petroleum Securities has just spudded in its No. 1 Newport, a wildcat south of the Huntington Beach Field in the Fairview-Newport area of Orange County and, while this district has not generally been regarded as potential oil land, the drill may prove this impression to be erroneous. One of the most discouraging developments in Southern California wildcat circles was the failure of the San Clemente Oil Co. to pick up even the slightest indication of oil in its Hawthorne wildcat a short distance removed from the Smith Petroleum Co.'s test, which actually pumped a small amount of crude from time to time. J. E. O'Donnell's Hawthorne wildcat is probably the most favorably located of any test undertaken in this area up to the present time and it will therefore be watched very closely from now on. O'Donnell, incidentally, has made better than 3,900 feet of hole in less than two weeks, but future work will be somewhat slower because of the closer watch now being maintained and the necessity of frequent coring. Hearst & Thompson are rigging up rotary equipment in their Inglewood wildcat and actual spud will probably be made within the next week. This location is quite favorable as the well is situated on a topographical high within the city limits of Inglewood.

The Monterey Park Petroleum Co.'s Browning wildcat at Monterey Park has attracted the eye of experienced oil men and, although it is not yet deep enough to pick up the pay, A. T. Jergins, the Marland and several other major operators have acquired protective holdings. The Associated's No. 1 Cypress, a wildcat located at Potrero, between the Inglewood and Rosecrans fields, is not showing up as well as might be expected as the sand at 4,450 feet apparently lensed out shortly thereafter as core samples at 4,620 feet show the prevailing formation to be a barren gray sand, although there have been at times intermittent streaks of brown shale which do not react any too favorably to the ether test. E. J. Miley logged a few minor showings in the wildcat well north of Huntington Beach which he took over from the Calnan Petroleum Corp. several weeks ago but the outlook at 4,865 feet is not any too encouraging. The Standard's wildcat at Olive and the Shell's No. 1 Allec near Placentia have been running a rather close race as far as footage is concerned and the outcome in each case will probably be decided some time during the current week, for unless something is picked up very shortly both will probably be placed on the doubtful list. The Shell's No. 1 Mission in the San Fernando Valley is just a trifle deeper than either of those two wells and it, too, will pass the critical stage within the next 10 days.

SOUTHWEST TEXAS

(Continued from Page 59)

No. 2 Bruni, Block 64, is location 600 feet to west line and 1,470 feet to south line.

Carolina-Texas Field

D. J. Simmons' No. 2 de la Garza, Survey 335, Block 8, located 150 feet to SW cor., is standing at 400 feet. Magnolia Petroleum Co.'s No. 2 Webster, SW NE NW Survey 684, locatetd 150 feet to NW cor., is drilling at 2,825 feet.

Andrews Pool

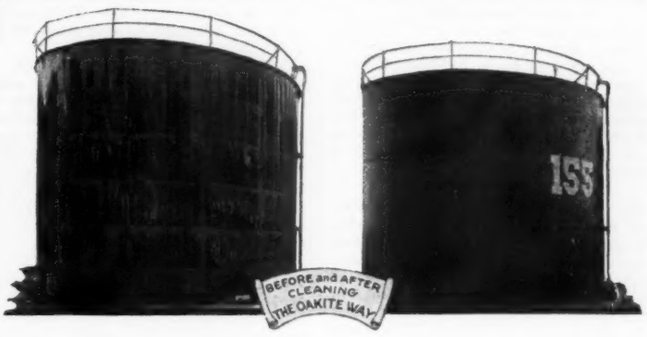
R. M. Strum's No. 1 Lopez, Survey 309, located 1,000 feet to NW cor. and 250 feet to north line, is drilling at 1,460 feet.

Cole Gas Field No. 2

Cole Petroleum Co.'s No. 36 Benavides, Survey 412, Block 14, located 159 feet to east line and 266 feet to north line, is drilling in hard rock at 4,981 feet; No. 49 Benavides, Survey 411, Block 2, located 160 feet to NE cor., is drilling at 1,537 feet.

Mirando Valley Pool—Zapata

O. W. Killam's No. 5 Hinnant, Survey



"Time to paint" or only "time to clean"?

An Oakite Service Man can soon tell you.

Your storage tanks or tank cars may be so dirty and discolored that painting seems necessary. Yet, the Oakite Service Man may find that all this equipment requires is *cleaning*. For washing the Oakite way removes dirt, oil, grease and soot thoroughly. So completely, that the original finish can often be restored almost as good as new. The photographs above show a tank before and after being *cleaned* with Oakite materials. In this case the expense of repainting was avoided.

If, however, such surfaces *do* need the protection of new paint, our Service Man can help you here also. He can show you how to put equipment in perfect condition for repainting —and how to save time, labor and money in doing it.

For money-saving ideas on any cleaning or related operation, consult our Oakite Service Man in your locality. His suggestions will point the way to *both* lower cleaning costs and lower painting costs. Write for booklet. No obligation.

Oakite is manufactured only by

OAKITE PRODUCTS, INC., 44C Thames St., NEW YORK, N. Y.

(formerly OAKLEY CHEMICAL CO.)

Oakite Service Men, cleaning specialists, are located at

Albany, N. Y. Allentown, Pa., *Atlanta, Altoona, Pa., Baltimore, *Birmingham, Ala., *Boston, Bridgeport, *Brooklyn, Buffalo, *Camden, N. J., Charlotte, N. C., Chattanooga, Tenn., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, O., Decatur, Ill., *Denver, *Des Moines, *Detroit, Erie, Pa., Flint, Mich., Fresno, Cal., *Grand Rapids, Mich., Harrisburg, Pa., Hartford, Houston, Tex., *Indianapolis, *Jacksonville, Fla., *Kansas City, *Los Angeles, Louisville, Ky., *Memphis, Tenn., *Milwaukee, *Minneapolis, *Moline, Ill., *Montreal, Newark, N. J., Newburgh, N. Y., New Haven, *New York, *Oakland, Cal., *Omaha, Neb., *Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, Pa., *Rochester, N. Y., Rockford, Ill., *Rock Island, *San Francisco, *Seattle, *St. Louis, South Bend, Ind., Syracuse, N. Y., *Toledo, *Toronto, Trenton, *Tulsa, Okla., Utica, N. Y., *Vancouver, B. C., Williamsport, Pa., Worcester, Mass.

*Stocks of Oakite Materials are carried in these cities.

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

74, located 1,980 feet to west line and 2,500 feet to south line, is moving on.

Luling Field—Caldwell

Magnolia Petroleum Co.'s No. 18 Rios, J. Henry Survey, is location 150 feet to SW cor.; No. 19 Rios, J. Henry Survey, is location in NE cor.; No. 6 Branyon, James Berry Survey, is location 425 feet northeast of No. 5. North & South's No. 1 Kelly is drilling at 7,226 feet, making about 1½ feet daily; No. 2 Tiller is drilling at 6,650 feet.

Dale Field

The Texas Company's No. 3 Beatty, Nich Kelly Survey, has derrick up; No. 1 Lackey, Nich Kelly Survey, 150 feet to northeast and northwest lines of lease, swabbed 55 bbls. in 24 hours; No. 2 Lackey, Nich Kelly Survey, 450 feet to northeast and 150 feet to northwest lines, is rigged up; No. 3 Lackey, Nich Kelly Survey, 750 feet to northeast lines and 150 feet to northwest lines, is standing at 2,145 feet. Sun-Empire's No. 3 Talley, W. C. Swearingen Survey, 760 feet to southwest lines of survey and 150 feet to northwest lines of lease, is drilling in, serpentine topped at 2,192 feet and showing oil. Humble Oil & Refining Co.'s No. 1 Clingensmith, Squire Damon Survey, 750 feet to southeast lines of survey and 150 feet to southwest lines of lease, swabbed 25 bbls. in three and one-half hours and put on rig; No. 2 Clingensmith, Squire Damon Survey, 750 feet to southeast lines of lease and survey and 150 feet to southwest lines of lease, on pump and making 5 bbls.; No. 3 Clingensmith, Squire Damon Survey, 150 feet to northeast lines of lease and 1,050 feet to southeast lines of lease and survey, in top of chalk at 2,412 feet; No. 4 Clingensmith, Squire Damon Survey, 150 feet to southeast lines of survey and 150 feet to southwest lines of lease, is drilling at 900 feet. William F. Morgan, Inc., No. 1 Osteen, W. C. Swearingen Survey, is cleaning out and settling liner after shot at 2,215 feet. No. 1 Moore, G. Jasper Gilbert Survey, is standing at 2,222 feet.

Adams Gas Field—Medina

Southern Gas Utilities, Inc., No. 1 C. J. Weimers, Survey 63, located 500 feet to north line and 500 feet to east line of lease, is drilling at 134 feet with 10-inch surface casing set at 82 feet. Mid-Kansas Oil & Gas Co.'s No. 2 Nixon, Survey 13-3-4, is moving in machinery. Witherspoon Oil Co.'s No. 1 F. Fasseler, Survey 799, located 550 feet to east line and 1,350 feet to south line of lease and survey, is drilling in Georgetown at 2,000 feet.

Kingsville Field—Kleberg

Houston Oil Co.'s No. 1 Kissman, Section 41, Block 9, is plugging back to make test at 1,950 feet; No. 2 Kissman, Section 41, Block 10, is making drill stem test at 1,935 feet. Humble Oil & Refining Co.'s No. 4 Kleberg, Section 40, Block 6, is pumping 3 bbls. daily at 3,062 feet; No. 2 Sexauer, Section 41, Block 11, is in hard sand at 2,668 feet with high sulphur odor.

Refugio Gas Field—Refugio

Houston Oil Co.'s No. A-2 Rooke is drilling at 2,600 feet; No. 11 W. J. Heard, Refugio Survey, is location 508 feet northeast of No. 10. Houston Gulf Gas Co.'s No. 2 Moody is drilling at 1,450 feet; No. 3 W. Heard, Refugio Survey, 150 feet to west line and 1,840 feet to south line, has set surface casing at 400 feet; No. 4 Shelly is deepening from 2,448 feet; No. 3 Ryals is drilling deeper.

CANADIAN FIELDS

(Continued from Page 62)

tion was encountered 328 feet in the Blairmore (Dakota) formation. New McDougall-Segur's No. 1 is producing at 2,595 feet from the same horizon. It is reported that the top of the sand was met at 2,620 feet and the drill continued 26 feet into the sand. The test finished with a 12½-inch hole. The oil rose 300 feet in the hole, when bailing was started. An 18-hour bailing test which reduced the height of the oil about 100 feet gave a production of 140 bbls., and it is estimated that the well will start with a production of 75 to 80 bbls. a day. The crude is a yellowish-green product testing 53 Baume, where crude from No. 1 tested 55.3. The bailing test will be continued for some time, after which a pump will be installed. New McDougall-Segur's No. 1 is now making about 60 bbls. a day from the same horizon.

McLeod Oil Co.'s No. 3, LSD 16, Section 1-20-3w5, which is making around 40 bbls. a day of light crude from the Dakota sand at 3,200 feet is installing a gas lift pump to meet conditions resulting from the shale at the bottom of the hole choking the present pump. Gas from McLeod's No. 2 will be used to force th crude oil from No. 3. McLeod's No. 1, same LSD, is drilling in the Dakota sand at 2,610 feet.

Illinois-Alberta Oil & Refining Co.'s No. 1, LSD 14, Section 12-20-3w5, is reported steadily increasing its production, its average for a five-day period running 98.32 bbls., compared with 85 bbls. in the summer. The high production for a day was 104 bbls. A similar increase of production with the approach of cold weather is noticeable in Royalite Oil Co.'s No. 4. Illinois-Alberta's No. 2, same LSD, has resumed drilling at 107 feet after setting and cementing casing to shut off surface water.

Great West Oils' No. 1 SE Section 7-20-2w5, is at 5,370 feet and fishing. This test has some tools jammed in the casing 2,000 feet from the bottom of the hole, and is again using nitric acid to eat away the casing.

British Dominion Oil Corp., LSD 4, Section 5-20 2w5, has 6¾-inch casing down to 5,963 feet and underreaming in a very hard formation. The test is in the Kootenays and is reported practically ready to start making new hole at 5,990 feet.

Spooner Oils' No. 1, LSD 12, Section 13-20-3w5, is at 4,612 feet and conducting a bailing test, with 1,200 feet of oil in the hole. As soon as bailing has been completed, drilling will be resumed.

Vulcan Oils' Election

Shareholders of Vulcan Oils, Ltd., held their annual meeting at Calgary last week. The directors of the company were unanimously re-elected as follows: President, A. G. Spooner; vice president, Dr. George M. Carson, secretary, A. J. Flood; directors, B. C. Jones, William Peterson, H. R. Spooner, L. H. Stack. The financial statement shows an income to the company since Vulcan's No. 1 came into production of about $10,000 a month, after allowing for royalties. This income has been partly applied to drilling Vulcan's No. 2, LSD 11, Section 13-20-3w5, which is at 3,750 feet with 8¼-inch casing in the top of the Fernie shales. No. 1 well, same LSD, is making approximately 100 bbls. a day of crude naphtha from the Madison limestone at 5,004 feet. Drilling indications are that No. 2 may get production at considerably less depth.

Royalite Oil Co.'s No. 10, NE Section 12-20-3w5, has started work on derrick. Royalite's No. 7, LSD 3, Section 13-20-3w5, has finished cementing casing in the top of the Madison limestone at 4,157 feet, and is waiting for the cement to set before drilling deeper into the limestone. Royalite's No. 8, LSD 9, Section 12-20-3w5, is at 1,786 feet and drilling. Royalite's No. 9, LSD 6, Section 13-20-3w5, is at 504 feet and installing rotary tools for the deeper drilling.

It is unofficially reported that Dalhousie Oil Co.'s No. 6, LSD 10, Section 13-20-3w5, has encountered a wet gas flow estimated at 1,000,000 feet a day. At last report the test was at 4,517 feet, with the crew cleaning out cavings and running casing. Dalhousie Oil Co.'s No. 1, LSD 4, Section 18-20-2w5, is drilling in the Madison limestone at 4,357 feet. Dalhousie's No. 5, LSD 16, Section 30-19-2w5, is testing production; last reports rated this well good for 250 bbls. a day of light crude. In the north end of the field. Foothills Oil & Gas Co., SW Section 26-20-3w5, is drilling at 2,668 feet.

Sentinel Oils, Section 8-20-2w5, is drilling at 2,385 feet with the 12½-inch casing down to 2,343 feet. Seneca Oils, LSD 1, Section 34-20-3w5, is at 2,948 feet and drilling, with casing at 2,935 feet. Okalta Oils' No. 1, LSD 1, Section 1-20-3w5, is in the Kootenays at 4,100 feet and has finished cementing a caving. Drilling will be resumed as soon as the cement sets. New Valley Oil Co.'s No. 1, LSD 4, Section 6-21-2w5, is shut down at 2,050 feet waiting for fuel.

Advance Oil Co. has located its No. 5 about 1 mile south of Dalhousie's No. 5 and is working on derrick. The test is expected to spud in before the end of October. A heavy duty rotary outfit will be used. The Advance Oil Co. holds approximately 500 acres in the vicinity of Home's No. 1 and Dalhousie's No. 5 producers, with 300 acres in other parts of Turner Valley.

Store Gas in Sands

The Canadian Western Natural Gas, Light, Heat & Power Co. of Calgary has finished a seven-day test of the possibility of utilizing the sands of the partially depleted Bow Island Field for the storage of surplus gas from other areas. In the course of the test approximately 35,000,000 feet of gas from the Foremost Field was transferred to the Bow Island Field through the Foremost-Bow Island pipe line. The Foremost Field has a rock pressure of about 840 pounds and the Bow Island Field about 150 pounds. Results of the test cannot yet be determined, but a report is being prepared by W. G. Gray, the engineer in charge. The test was undertaken with a view to determining whether the Bow Island Field could be utilized for the storage of the waste gas from the Turner Valley Field.

Shareholders of the Turner Valley Oil Co. at their annual meeting at Calgary last week re-elected the entire board of directors. The company holds 1,139 acres in the Turner Valley Field, on the north branch of Sheep Creek and northwest of the Foothills Oil & Gas Co. well. Negotiations have been in progress for some time for the development of this acreage on a royalty basis.

The Appeal Court at Calgary recently reserved judgment on an appeal involving oil rights on lands homesteaded between the years 1889 and 1908. The actions were brought, one by John Creighton of Calgary against United Oils, Ltd., and one by Frank Starley of England against New McDougall-Segur Oil Co., Ltd. The point at issue is whether an order in council passed in 1889 providing for the reservation to the crown of mineral rights and incorporation of such reservation in patents to homesteaders was effective to reserve oil and gas rights. The plaintiffs contended that the order in council was without authority and contrary to the act under which it was issued; and further, that even if it were valid it was not effective to reserve oil and gas rights. The Appeal Court reserved judgment.

Moose Mountain District

In the Moose Mountain district, Signal Hill Cil Co.'s No. 2, LSD 9, Section 34-23-5w5, is at 1,450 feet and running 10-inch casing preparatory to resuming drilling.

In the Morley Reserve area Gold Coin Oils' diamond drill test is reported drilling at 3,711 feet and apparently close to the contact of the Benton shale and Blairmore (Dakota) sand. Some addition gas has been encountered. Wabash Oils, Ltd., has cemented casing. Watson Oils, Ltd., of Vancouver, B. C., has located a test about three-quarters of a mile north of the Wabash, on acreage owned by Chiniki Holding Co. and will put down a diamond drill hole. United States interests are reported negotiating for some 3,500 acres held by Tregillus & Russell and Cobb & Warren Syndicate.

On the Sinclair structure, Imperial Oil, Ltd.'s No. 1 Highwood, LSD 3, Section 36-18-3w5, is reported drilling at 3,347 feet.

In the Pincher Creek district, southwestern Alberta, Mount Royal Oil & Gas Co.'s No. 1, LSD 4, Section 7-6-1w5, has encountered a wet gas flow at 395 feet, estimated at 500,000 feet a day. Drilling is being continued at 425 feet. The Mount Royal test is being financed by Shelby, Mont., interests, on acreage filed by the Eugene Cobb Syndicate. Jean Gerlough is geologist for the company. The test started drilling in the Blairmore (Dakota) formation of interspersed shales and sands. The gas at 395 feet is claimed to be wet gas, but this has not definitely been determined; the product has no sulphur odor. In drilling, the 15½-inch casing was set at 250 feet to shut off sulphur water. The company looks for production around 1,500 feet. No. 2 test has been located in SE Section 15-6-1w5, and a third well will be located later.

Warner District

In the Warner district, near the international boundary, Gas Transportation & Production's No. 1, NE Section 21-4-18w4, has resumed drilling at 410 feet after a several weeks' delay due to the loss of the outfit by fire. In the Cypress Hills area, Eagle Butte Oil Co., LSD 3, Section 31-7-4w4, is drilling. Near Coutts, Urban Oils, Section 4-1-15w4, is dismantling its outfit for removal to the Turner Valley Field where the owners have a drilling contract. The Urban test was a continuation of a test started some years ago on the Quarantine Reserve, Township 1-15w4, by the J. F. M. Moodie Syndicate of Calgary. Urban Oils carried this test into the Madison limestone at 3,420 feet and secured a show of oil in the deep lime but no commercial production.

On the Montana side, considerable attention is being given the Sweetgrass Hills structure, almost due south of the Rogers-Imperial gasser in LSD 9, Section 29-1-11w4. North of the Sweetgrass Hills and fairly close to the boundary the Sunburst Oil & Refining Co. is down 1,200 feet with its Flat Coulee test, with four shows of gas. West of the hills on the Bow and Arrow structure the Montana-Pacific Oil Co. has got some gas and is drilling close to the Sunburst sands. On the Bear's Den structure, Chester Ois, Inc., is reported drilling at 600 feet. A slight show of free oil was met at 385 feet and commercial production is thought possible at 1,200 feet.

On the Valentine structure the Montana-Major test, cemented at 1,200 feet, has resumed drilling, with possibilities of production around 1,750 feet. Senator E. Michener of Calgary has taken over some 1,000 acres adjoining the Montana-Major location. Overseas Petroleum Co., financed largely by Calgary capital, has a fair show of high-grade crude in its No. 1 well in the Kevin-Sunburst Field at 1,860 feet.

On the Ribstone-Blackfoot structure east of the Wainwright Field, Advance Oil Co.'s No. 3, LSD 1, Section 1-45-1w4, is getting ready to resume work at 504 feet. Ribstone Oils' No. 1, LSD 1, Section 1-46-1w4, is reported resuming drilling after cementing casing at 1,925 feet. On the Saskatchewan end of the structure, London-Ribstone's No. 1, LSD 14, Section 10-43-28w3, is drilling. In the Readlyn area of Saskatchewan, the Ribstone-Wainwright Oils' test is reported drilling below 150 feet.

On the Bow and Arrow structure, the Kyle-Hart-Green Syndicate of Winnipeg is reported drilling on top of the Sunburst sand. This test is thought to have an important bearing on oil possibilities immediately north of the international boundary, as the structure is believed to extend into the Alberta plains region. At last reports the drill was around 1,800 feet and working in a hard cap rock, apparently overlying the Sunburst sand. If production is not secured in the Sunburst, drilling will be continued into the Ellis, which should be met 240 feet down. A standard outfit is being used, and at this depth is drilling a 10-inch hole. A flow of gas estimated at 200,000 feet a day was met at 1,200 feet depth in a break between the Colorado and Kootenay formations, and this is used for fuel for drilling. The location is 3½ miles south of the international boundary and due east of the Hart-Green No. 1 Lerum in SW Section 11-37-2w. The latter, which was some 300 feet structurally higher than No. 2, got a fair show of crude oil at 2,335 feet but lost the hole. The Kyle-Hart Green-Syndicate is headed by T. B. Kyle of Winnipeg, Manitoba, and financed largely by Winnipeg capital.

In southeastern British Columbia, Glacier Oil Co.'s No. 1 in the Sage Creek district is at 3,280 feet and is still being cleaned out. There are several hundred

BOVAIRD
Grip CASING
ELEVATORS
and SPIDERS
are safe and speedy
– these two advantages under all conditions encountered in running and pulling have led careful operators to Insist on BOVAIRD when their wells are equipped with ELEVATORS and SPIDERS
FOR SALE BY ALL LEADING SUPPLY HOUSES
904 Mid-Continent Building
TULSA
BOVAIRD

feet of debris in the well, and another shot may be tried to free the tools. A few barrels of high-grade crude have been bailed from the hole in the cleaning process. The offset test by the Ferd'g interests for the B. C. Coal & Oil Development Co. is drilling with a 15-inch hole.

In Saskatchewan, Unity Valley Oil Co.'s No. 1, SE Section 23-41-24w3, is at 2,925 feet and is reported to have struck an additional gas flow, estimated at 5,000,000 feet a day. The test is shut down waiting for tools and casing. Unity Valley's No. 2, same section, is being rigged up and will spud in about October 20. In the Simpson district, the Simpson Oil Co., Section 9-29-25w2, got an oil show around 1,100 feet. The oil is a high-grade crude, about 37 Baume, with a paraffin base. The test is being drilled deeper for commercial production.

SOUTHWEST WILDCATS

(Continued from Page 59)

well was in the syncline rather than on the anticline.

Brooks County

The Texas Company's No. 3 Lasater, Survey 329, Gly Hill, located 2,380 feet to north line and 450 feet to west line, is drilling in blue shale at 4,085 feet.

Duval County

Schlessinger Oil Corp.'s No. 1 Moody, Survey 60, located 330 feet to north line and 1,650 feet to east line, lost hole at 2,401 feet and is skidding derrick 175 feet north for No. 2; No. 2 Moody, Survey 60, is location 155 feet to north line and 1,650 feet to east line. National Oil Co.'s No. 1 Ball, Survey 16, located 450 feet to north line and 150 feet of east line, has derrick up and is building roads to location.

Hidalgo County

Queen City Oil & Gas Co.'s No. 1 Adams, Lot 1, Block 82, 3 miles north of Mercedes, is fishing at 2,120 feet. D. L. Smith Oil Co.'s No. 1 Daskan has sand at 2,107 feet.

Jim Hogg County

Paesano Oil Syndicate's No. 1 Campbell, Las Vivoritas grant, is drilling again at 1,502 feet. O. W. Killam's No. 1 Canales Balnurato grant, is drilling at 600 feet. Holden and others' No. 3 Jones, Share 27, Block 136, located 330 feet to east line and 440 feet to north line, is standing at 2,548 feet. Hamilton and others' No. 1 Holbien, Block 44, located 158 feet to south line and 363 feet to west line, is preparing to resume drilling at 2,080 feet.

Starr County

Woodruff and others' No. 1 Kelsey, Porcion 76, is rigging up. Harston and others' No. 1 H. Guerra, Survey 43, located 2,400 feet to south line and 2,000 feet to west line, is rigging up. T. W. Foltz and others' No. 1, Survey 301, located 150 feet to northwest lines and 2,400 feet to west line, is rigging up.

Bexar County

Allen Burnam's No. 1 Ward, A. A. Gardiner Survey, 1,200 feet to east line and 325 feet to south line is shut down at 318 feet.

Bee County

D. Hewitt's No. 1 Ray, G. A. Ray Survey, west central, is drilling at 2,300 feet; No. 2 Ray, unloading derrick timbers at Pettus. Nichols & White's No. 1 Hicks, Block 19, NW cor., is shut down at 1,408 feet. Red Ant Oil & Gas Co.'s No. 1 Perry & Chestnut, B. Q. Hadley Survey, 450 feet to east line and 1,600 feet to south line of farm, is drilling at 600 feet.

Blanco County

C. W. Bates is preparing to make location 8 miles east of Blanco City. Miller Creek Leasing Corp.'s No. 1 Glasscock, Survey 50, is location 150 feet to CEL.

Caldwell County

Calco Petroleum Co.'s No. 2 Thomas, 600 feet southeast of No. 1, is at 1,820 feet. Detex Oil Co.'s No. 1 Hardeman, 4 miles north of Luling, is at 2,987 feet. Martin & Wright's No. 1 Mat Blackwell, 1 mile east of Burdette Wells, has been spudded in. Ratcliffe's No. 1 J. L. New, James Hindes Survey, 150 feet to west line and 600 feet to south line, is at 2,914 feet and washing and setting liner. Sutton & Smith's No. 1 Carter, Green Hindes Survey, 150 feet to CNL, is at 2,597 feet; No. 2 Carter is location 300 feet east of No. 1.

DeWitt County

J. W. Allen's No. 1 Roeder is location 12 miles west of Yorktown. Collette Oil Co.'s No. 1 Boldt, James Lasater Survey, is location 3,129 feet to east line and 800 feet to south line. Empire Southern Oil Co.'s No. 2 Smith, Survey 3, has set casing and is ready to bail at 2,860 feet. Hogue and associates' No. 1 is location west of Williams & Gates' No. 1 Gohmert. McNeil & Matthews' No. 1 Toland, A. Dillard Survey, is location 150 feet to north line and 300 feet to east line. Williams & Gates' No. 1 Gohmert, G. W. Brooks League, 175 feet to north line and 300 feet to east line, is shut down at 760 feet. Yoro Development Co.'s No. 1 Tully, spudded in and shut down.

Dimmitt County

Humble Oil & Refining Co.'s No. 1 City National Bank, Survey 654, located 700 feet to north line and 2,000 feet to east line, is drilling at 4,021 feet.

Frio County

F. A. Lain and F. A. Brown's No. 1 Edwards, Hooper & Wade Survey, 920 feet to CNL, is drilling at 500 feet. P. A. Neilan's No. 2 Blackaller, James Gouley Survey, is location.

Goliad County

Houston Oil Co.'s No. 1 Lott, G. Cortinas Survey, 2,000 feet to north line and 300 feet to west line, is testing at 2,902 feet; No. 4 Pettus, P. Trevino Survey, 1,200 feet southwest of No. 2, is rigged up. C. W. Simpson's No. 1 Ideus, W. H. Pendleton Survey, 156 feet to north line and 540 feet to west line, cored sand at 1,600 feet showing little gas, claims to have 80 feet of sand.

Gonzales County

Dunning & Pierce's No. 1 Wilkerson, P. Ward Survey, 150 feet to CNL, is drilling. Bristol Oil & Gas Co.'s No. 2 Denman, A. Zumwalt Survey, is shut down at 807 feet. Joe Bruner's No. 1 Vaughn, Kent Survey, 200 feet to west line and 300 feet to south line, is standing at 1,406 feet. Gonza Petroleum Co.'s No. 1 Elder is standing at 1,636 feet; No. 2 Elder, F. R. Whitney Survey, Block 11, is standing at 1,250 feet; No. 1 Sinclair, 4 miles northeast of No. 2 Elder, is standing at 1,200 feet. L. L. Jones' No. 1 Campbell, Moore & Bridges Survey, is shut down at 100 feet. The Texas Company's No. 2 Plowman, Byrd Lockhart Survey, is drilling; No. 3 Plowman, Byrd Lockhart Survey, is location 2,640 feet southeast of No. 1. L. P. Unkel's No. 1 Hampton, C. H. Jaeger Survey, at 240 feet to southwest lines and 120 feet to southeast lines is at approximately 600 feet. H. B. West trustee's No. 2 Preston, W. W. Pace 1-3 League, P. R. Whitney Survey, 100 feet northwest of No. 1 Preston, is skidding derrick and rig of No. 1 over.

Guadalupe County

F. A. Lain's No. 1 Weinert, W. K. Estell Survey, 150 feet to CNL, is resuming drilling at 3,004 feet to go 4,000 feet or 50 feet into Edwards lime. H. H. Temple's No. 1 McAllister, Edward Kellett Survey, 450 feet to northeast lines and 1,420 feet to northwest lines, is shut down at 1,940 feet for titles.

Hays County

J. E. Rodgers' No. 1 Hohenburg, 2½ miles east of San Marcos, is at 1,961 feet claiming to be in Glenrose with showing of oil.

Jackson County

Houston Gulf Gas Co.'s No. 6 Druschel, Edna gas field, is waiting to make drill stem test at 2,679 feet.

Karnes County

Reynosa Oil Corp.'s No. 2 Butler, Block 43, located 1,000 feet south of No. 1, is working on test at 1,947 feet.

Lavaca County

M. L. Benedum's No. 1 Russek, John Linn 1-3 League, J. G. Reynolds Survey, Block 38, located 1,060 feet to west line and 210 feet to south line at 3,275 feet tested salt water and are waiting orders.

Kinney County

Havelin Oil Co.'s No. 1 Weatherby, Section 26, Block 5, located 660 feet to NW cor., is shut down at 4,365 feet. W. A. Stephens and others' No. 1 Clamp, John Winters Survey No. 346, at 5,676 feet to south line and 5,360 feet to west line, is shut down at 1,070 feet with slight show of gas.

Lee County

Allen Creek Oil Co.'s No. 1 Henderson, William Mock Survey, 3,960 feet to west line and 1,350 feet to south line, is fishing at 1,100 feet.

Live Oak County

Delta Oil Co.'s No. 1 McNeil, Jane Curry Survey, is shut down at 1,010 feet. F. A. Lain is making location for test 3 miles north of the Cartwright Field. Houston Oil Co.'s No. 19 Cartwright, W. J. Cannon Survey, 1,500 feet northeast of No. 17, is rigged up; No. 20 Cartwright, M. Trudo Survey, is location in SE cor.; No. 21 Cartwright, J. M. Colchado Survey, is location 2,900 feet northeast of the No. 18. Ed Leach's No. 1 McWhorter, 175 feet south of Lagarto Creek and 175 feet west of Neuces River, has derrick up and moving in machinery. R. P. Lightfoot's No. 1 Thomas, Survey 963, Block 19, west central, is standing at 1,316 feet. Roxana Petroleum Corp.'s No. 1 West, is making location for test in south pasture of the West ranch. Simmons Oil Co.'s No. 4 Sartain, is shut down at 2,303 feet; No. 2 Reagan is location 1,320 feet east of No. 1; No. 1 Griff is location. J. W. Walton's No. 1 Roberts, west of Three Rivers, is pulling casing at 1,860 feet to deepen.

Medina County

California-Medina's No. 1 Rothe, Survey 1,012, is shut down at 3,270 feet. Magnolia Petroleum Co.'s No. 1 Keller, Survey 8, located 210 feet to north line and 150 feet to west line and 4 miles northeast of the Adams gas field, is rigging up. Medina Oil Co.'s No. 1 Taylor, Survey 135, is drilling at 1,230 feet. R. P. O'Brien's No. 1 Nixon, Survey 531, located 1,945 feet to west line and 833 feet to south line, at 1,080 feet has casing joined together, liner pulled and another showing of oil in sandy shale, setting perforated liner from casing set at 857 feet and will test again. Cecil Switzer's No. 1 Zerr Survey 459, west central, is drilling below 3,485 feet.

Maverick County

Johnstone & Hout's No. 1 Whipff is at 1,365 feet. Ryan Consolidated Petroleum Co.'s No. 1 Indio, Survey 14, center, is fishing at 2,300 feet; Rycade Oil Co.'s No. 1 Chittim, Section 129, Block 7, is sidetracking at 4,115 feet; No. 2 Chittim, Section 158, Block 7, at 350 feet to NE cor., is drilling at 700 feet; No. 2 Sullivan is fishing at 5,132 feet.

McMullen County

Houston Gulf Gas Co.'s No. 2 Fischer, 600 feet west of Frio River and 1,700 feet south of No. 1, is reaming at 1,180 feet, bottom of hole in green shale. Nelson & Wood's No. 1 Shiner, Survey 48, Block 74, located 1,000 varas to east line and 350 varas to south line, is standing at 1,750 feet. George Pickett's No. 1 Jacob, Survey 7, located 660 feet to CNL, is standing at 3,030 feet.

San Patricio County

Houston Oil Co.'s No. 1 Baldwin, Roos Survey, Block 5, is location 250 feet to west line and 200 feet to south line; No. 2 Humble, Roos Survey, Block 7, located 167 feet to SE cor., is drilling; No. 3 Humble, Roos Survey, Block 7, located 200 feet to north line and 250 feet to east line, has derrick up. Mission Drilling Co.'s No. 1 Harwood, SE cor., is drilling at 1,800 feet; No. 2 Cage is in sand at 2,303 feet and preparing to make drill stem test. National Oil Co.'s No. 1 Sullivan, J. C. McMullen Survey, 500 feet to SW cor., is drilling at 1,135 feet. George B. Pickett's No. 1 Garrett, Taft Survey, Block 23, located 1,500 feet to west line and 1,000 feet to south line, is drilling in 2,110 feet in red gumbo. Sexat Oil Co.'s No. 9 Rachal is drilling at 1,450 feet; No. 12 Rachal is ready to drill in at 2,312-16 feet; No. 7 Dunn, C. P. Rachal Survey, is location 150 feet to north line and 811 feet to east line. John Sigmund's No. 9 Robinson, 350 feet southeast of No. 7, is drilling at 1,373 feet in tough formation, having passed blue and pink gumbo. J. E. Walsh's No. 1 Clara M. Oven, George Paul Subdivision No. 45, located 150 feet to SW cor., cored at 2,920 feet.

Travis County

Frank Gomillion and others have spudded in test.

Val Verde County

A. M. Blume's No. 1 Moore, Section 183, at 330 feet to north line and 1,320 feet to west line is shut down at 2,900 feet. Crusoe Williams' No. 1 Holman, Section 5, is shut down at 2,940 feet for casing. Douglas Oil Co.'s No. 1 Sellers, Section 82, Block A, is shut down at 3,500 feet for orders. East Del Rio Oil Co.'s No. 1 Russell, Section 133, Block 4, is straightreaming at 3,200 feet. Independent Operator's No. 1 Whitehead, SE SE, Section 30, Block 4, is shut down at 3,925 feet. Magnolia Petroleum Co's No. 1 Whitehead, Section 81, Block D, is drilling at 4,300 feet in black shale. O. O. Owens and others' No. 1 Mills, Section 128, Block 1, center of section, is shut down at 2,820 feet, showing 500,000 feet of gas.

Zavala County

J. G. Pundt's No. 1 West, Fuentes Survey, NW cor., is waiting on casing at 936 feet. B. F. Thompson's No. 1 West, northern part of county, is standing at 228 feet.

NORTH LA.-ARK.

(Continued from Page 55)

has completed No. 1 Feazel, Section 17-19-4e, making 11,000,000 feet of gas with a rock pressure of 2,165 feet from a formation at 2,165 feet. J. S. Gould has abandoned No. 1 Grayling, Section 11-15-2e. It was dry at 3,010 feet. Hatcher & Evans have cemented 8-inch casing at 826 feet in No. 6 Hatcher, Section 16-19-4e. Imperial Oil & Gas Co. has a derrick up for No. 2 Stubbs, Section 13-19-3e. Ladell Properties, Inc., got 9,000,000 feet of gas at 2,175 feet in No. 44 fee, Section 6-19 5e. Rock pressure is 440 pounds. Ouachita Natural Gas Co. has started drilling in No. 2-A De-Arbonne, Section 34-19-3e.

Southern Carbon Co. has cemented 6-inch casing at 2,081 feet in No. 1 Harris, Section 20-20-4e, Union Parish.

Webster Parish

Crusaders Oil & Producing Co. is waiting on a pumping rig for No. 18 Hope, Section 24-21-10. It tested 1,000 feet of fluid, 50 per cent salt water, at 2,510 feet. Magnolia Petroleum Co.'s No. 1 G. W. Cole, Section 27-21-10, is drilling at 2,080 feet. This company's No. 1 D. G. Cox, Section 22, is drilling chalk rock at 1,650 feet. In the same section, No. 4 Marshall is being cleaned out at 3,578 feet. The 6⅝-inch casing has been cemented at 2,526 feet in No. 5 Marshall. No. 1 Waller-O'Bier, Section 32-23-9, is making 23,000,000 feet of gas, having been completed at 2,665 feet. No. 1 Wise, Section 30-23 9, is down 421 feet where 10¼-inch casing has been set. Ohio Oil Co.'s No. 4 Holloway, Section 23-21-10, is drilling shale at 3,597 feet. Woodley Petroleum Co. has gone into its No. 1-B Cox, Section 23-21-10, which was completed last month at 4,310 feet as a small gasser, and is drilling deeper at 4,361 feet.

Arkansas

Smackover Field

In the Norphlet area, Lion Oil & Refining Co. has 1,200 feet of oil standing in No. 7 Hays, Section 4-16-15, from a sand at 2,280-85 feet. The well will be put on the pump. In the same section, Gulf Refining Co.'s No. 43 Murphy is down 2,600 feet, where 4½-inch casing will be set. Keen & Woolf have cemented a short string of 4-inch casing at 2,725 feet in No. 4 Murphy, Section 9. Magna Petroleum Co. is drilling at 2,500 feet in No. 6 Tatum, Section 7. Magnolia Petroleum Co.'s No. 7 Wilson, Section 17, is drilling at 1,950 feet. Standard Oil Co.'s No. 33 Murphy, Section 4, is in rock at 2,585 feet. On the Ouachita County side, Exchange Oil Co. is bailing a sand at 2,589-2,600 feet in No. 8 Berg, Section 4. This test was whipstocked at 2,000 feet and a string of 4½-inch casing set at 2,589 feet. Marine Oil Co. is swabbing No. 14 Snyder, Section 34-15-

15. This test encountered a sand at 2,357-65 feet. This is in the same section with Owenwood Oil Corp.'s No. 2 Snyder, which was completed during the week pumping 75 bbls. of oil and 225 bbls. of salt water from a sand at 2,283 92 feet.

In the Louann Pool of Union County, Smitherman & McDonald have a sand at 2,230-40 feet in No. 2-A Saxon, Section 32-15-16, and are getting ready to swab. The Texas Company's No. 1 Davisson, Section 26-15-16, Ouachita County, showed 200 feet of salt water when tested by a sand tested at 2,584 feet. It is drilling deeper.

Nevada County

Humble Oil & Refining Co. has completed No. 1 Fairchild, Section 6-14-20, Irma Pool, pumping 50 bbls. daily from sand at 1,187-91 feet. This company also has a second test on th's lease down 1,183 feet, where 6⅝-inch casing has been cemented. In the same section, J. J. O'Brien has a derrick up for another test, No. 2 Robert Haynie. To the west in Section 1-14-21, his No. 5-A Moss has encountered the oil sand at 1,136-40 feet and is to be put on the pump. He has two other wells waiting on pumping rigs in the same section, the No. 4-B Haynie and the No. 8-B Moss. No. 9-B on the latter lease also has casing cemented on top of the sand at 1,149 feet. To the south, Burnham and associates have the sand at 1,259-62 feet and are waiting on a pumping rig.

McDonald and associates' No. 1 Pelt, Section 9-15-22, about 6 miles southwest of the Irma Pool, is drilling at 980 feet.

LA.-ARK. WILDCATS

(Continued from Page 55)

of northeastern Union County, where seven new tests are being started, there was very little of interest in Arkansas wildcatting. In Miller County, east of Texarkana, Guest and associates have shut down No. 1 M. & P. Bank, Section 30-15-26, after testing a salt water flow at 2,929 feet. The Texas Company has a derrick up for No. 1 Alexander, Section 8-17-19, Columbia County, southeast of the Stephens Field.

Greenwood Extension Possible

Greenwood Producing Co.'s No. 1 McCutcheon, Section 15-17-15, Caddo Parish, Louisiana, has 6-inch casing cemented at 2,536 feet preparatory to testing gas showings encountered there. If this test makes a gas well it will mean a 6-mile extension to the Greenwood gas district. The test is just a short distance west of Shreveport.

Wildcat operations during the week were:

North Louisiana

Bienville Parish

Edwin J. Forest is drilling at 2,170 feet in No. 1 Perritt, Section 11-17-16. Lake Bisteneau Gas Co. has started a test, No. 1 State, Section 16-16-10, and is down 200 feet where surface casing has been set. Louisiana Petroleum Co. has a derrick up for No. 1 Hays, Section 18-16-5.

Bossier Parish

Bahan & Davis are drilling at 500 feet in No. 1 Dodson, Section 15-23-12, Carterville district. Bethany Oil & Gas Co. has cemented 6-inch casing at 3,080 feet in No. 2 Dodson, Section 16. Magnolia Petroleum Co. is bailing casing at 3,083 feet in No. 1 Dodson, also Section 16. This company's No. 1 (Zulu) Roberson, Section 23, is drilling chalk rock at 2,485 feet. Northwest Louisiana Gas Co. is drilling at 2,715 feet in No. 1 Mays, Section 22-23-12. O'Brien Brothers are rigging up for No. 1 Dodson, Section 22.

Southeast of the center of the Carterville activity, The Texas Company's No. 1 Wilkerson, Section 36, has been deepened to the pay level encountered in Carterville wells after testing 500,000 feet of gas and a show of salt water at 2,707 feet. Sales & Walker's No. 3 Bollinger, Section 30-23-11, a mile northwest of The Texas Company's test, is in a good-looking sand and is waiting on a string of 4½-inch casing. It is at a total depth of around 3,089 feet. Doern and associates' No. 1 Bollinger, Section 9-22-11, is drilling below 2,200 feet. Hamiter and associates' No. 1 Hamiter, Section 10-23-13, west of the Carterville Field, has been rigged up.

H. S. Goodwin, trustee, is drilling at 1,220 feet in No. 1 Curtiss, Section 2-16-13. A Nacatoch sand test at 1,006 feet showed dry. Jensen, Rogers & Gibson have cemented 6-inch casing at 1,220 feet in No. 1 Hale-Rumbaugh, Section 17-18-11. The test is in a sand at 1,221-24 feet. Sligo Syndicate's No. 2 Smith, Section 24-17-12, Sligo district, is down 833 feet where 12½-inch casing has been cemented. Triangle Drilling Co. is drilling below 2,000 feet in No. 1 Sentell & Dickson, Section 3-20-14. Woodley & Collins are drilling at 1,875 feet in No. 1 Lincoln, Section 21-16-10.

Caldwell Parish

Southern Crude Oil Purchasing Co. is drilling shale at 1,750 feet in No. 8 Caldwell, Section 5-13-5e.

Catahoula Parish

S. D. Hunter is drilling anhydrite at 2,028 feet in No. 3 Tensas Delta, Section 4-9-8e. Lochnager Oil & Gas Co. has cemented 6-inch casing at 3,114 feet in No. 2 Beasley, Section 26 9 6e. Lochnager and associates are rigging up for No. 1 McMillan, Section 29-9-6e.

DeSoto Parish

American Control Oil Co. is drilling at 1,000 feet in No. 1 Lanier, Section 7-11-11. Dixie Oil Co.'s No. 1 Jenkins, Section 9-12-11, is drilling lime and shale at 5,617 feet. Magnolia Petroleum Co. is bailing to test No. 1 Logan, Section 3,195 feet. William Sebastian has a location staked for No. 1 Wolf, Section 3-10-13. The Texas Company is cleaning out hole at 2,429 feet in No. A-6 Wemple, Section 2-12-12. Wingfield and associates' No. 1 Haywood, Section 18-10-12, is drilling at 1,800 feet. Pittsburgh Exploration Co.'s No. 3 Moore, Section 12-11-6e, showed salt water after drilling plug cemented at 710 feet.

Natchitoches Parish

Ohio Oil Co. has a fishing job in No. 2 L. & A., Section 26-13-6w, with the hole down 3,251 feet.

Red River Parish

J. H. Askew's No. 1 Richardson, Section 25-13-11, was bailed dry at 2,475 feet. It is drilling ahead with cable tools at 2,482 feet. Hazlett & Simmons' No. 2 Neeley, Section 1-14-12, is down 500 feet.

Richland Parish

Aarnes and associates' No. 1 Hawley, Section 3-17-9e, is drilling shale at 2,818 feet. Gulf Refining Co. has cemented 6⅝-inch casing at 2,322 feet in No. 3 Marshfield, Section 30-17-6e. Gulf also has a rig up for No. 2 Wayne, Section 23-16-5e. Moody & Seagraves are drilling shale at 2,200 feet in No. 1 Jones, Section 15-18-7e. Natural Gas & Fuel Corp. is killing the gas encountered at 2,367 feet in No. 1 Sartor, Section 20-16-6e, preparatory to drilling deeper. Standard Drilling Co.'s No. 1 Delta Hardwood, Section 22-16-7e, has been shut down at 1,880 feet. Texas-Louisiana Carbon Co.'s No. 1 Broughton, Section 1-15-6e, is drilling gumbo at 2,891 feet. Woodley Petroleum Co. and Triangle Drilling Co. have cemented 8¼-inch casing at 1,800 feet in No. 1 Hemler, Section 31-18-7e. Total depth is 2,246 feet.

Sabine Parish

Arkansas Fuel Oil Co. is drilling shale at 3,776 feet in No. 1 Logan, Section 32-10-13. This company's No. 2 Moore, Section 32-10-12, tested 100 bbls. of oil in a formation at 3,208-14 feet but is to be deepened. Frazier and associates are fishing drill stem in No. 1 Harris, Section 29-10-12. The hole is down 3,140 feet. Magnolia Petroleum Co.'s No. 2 Hall, Section 33-10-12, is drilling lime at 3,176 feet. This company's No. 2 Rembert, Section 32, is drilling chalk rock at 1,890 feet. A. H. Tarver is drilling limey shale at 3,335 feet in No. 1 Long Bell, Section 5-8-13. H. P. Tate has abandoned as dry at 3,295 feet his No. 1 Cook, Section 23-10-11. L. M. Emlet is drilling at 3,442 feet in No. 7-B Bowman, Section 14-7-14.

Webster Parish

S. A. Lane has a rig up for No. 1 Miles, Section 24-17-9, near the Vacherie salt dome in the southeastern corner of the parish. Shreveport-El Dorado Pipe Line Co. has abandoned No. 1 Gamble, Section 33-20-8. It was dry at 3,290 feet and no test was made.

West Carroll Parish

Palmer Corp. is down 2,843 feet in No. 1 Pioneer, Section 16-20-10e, but the drill stem is stuck in the hole. Phillips Petroleum Co.'s No. 1 Marion, Section 32-20-9e, is drilling hard rock at 2,638 feet.

Winn Parish

Dodge & Cordell have abandoned No. 1 Tremont, Section 35-13-3w. It has been shut down since July with the hole at a depth of 1,558 feet. Ohio Oil Co. is fishing drill stem in No. 1 Edenborn, Section 31-10-4w. The hole has been drilled to 525 feet. This company has a rig up for No. 2 Rowan, Section 5-12-1w. H. R. Roark is underreaming the 8-inch casing at 303 feet in No. 3 Southern Minerals, Section 19-11-3w.

Arkansas

Ohio Oil Co. is setting a string of 4½-inch casing at 3,013 feet in No. 2 Crain, Section 1-17-14, Champagnolle district, in an attempt to save the well instead of drilling a new hole. This is the well which blew in making 30 bbls. of clean oil the first 30 minutes, but in which salt water broke in, increasing the total fluid flow to more than 7,000 bbls, of which about 93 per cent was salt water and sediment. This company has a derrick up for its third test on this lease and a rig up for No. 1 (W) Pumphrey, same section. Locations have been staked for three other tests in this district. Garrett-Modisette Drilling Co. has one on the Gregory lease, Section 10. Ginther and associates have another on the McGough farm, Section 16-17-13. Roark and associates have one for No. 1 Bull, Section 19-17-13.

Booth and associates' No. 1 Rowland, Section 8-17-11, is drilling lime at 2,200 feet. In Section 21, Pitcher and associates have a rig up for No. 1 Arkansas Timber Co.

W. R. Keever is setting 10-inch surface casing at 126 feet in No. 3 Ezell, Section 12-17-15. Rice and associates' No. 1 Newton, Section 13-17-16, tested salt water at 2,924 feet and has been shut down.

Ouachita County

Magnolia Petroleum Co. is drilling hard lime at 2,772 feet in No. B-1 Stout, Section 28-14-16.

Ashley County

Glassell and associates' No. 1 Keller, Section 10-19-5, is drilling gas rock at 2,948 feet.

Calhoun County

Genther and associates' No. 1 Stout, Section 3-14-16, is shut down at 1,980 feet.

Columbia County

Columbia Oil Syndicate has abandoned No. 1 Whitehead, Section 14-19-23. It has been shut down since April after encountering a fresh water flow at 2,350 feet. The Texas Company has a derrick up for No. 1 Alexander, Section 8-17-19.

Lafayette County

Kensaw Syndicate's No. 1 Kensaw, Section 31-19-24, is drilling at 2,440 feet.

Miller County

Guest and associates' No. 1 M. & P. Bank, Section 30-15-26, has been shut down after testing salt water at 2,929 feet. Lenz and associates' No. 1 Mann, Section 22-15-26, is drilling at 2,465 feet.

GULF COAST FIELDS

(Continued from Page 57)

16 feet. Five miles northeast of Port Arthur Jim McMurry's No. 1 Crosby is drilling shale at 3,200 feet.

Liberty County

In the Hull dome area the Big Dome interests' No. 3 Palmer was abandoned at 2,000 feet. Republic Production Co.'s No. 43 Dolbear is drilling at 1,200 feet and No. 99 Dolbear is being bailed at 2,524 feet. The Texas Company's No. 7 Hannah-Vacuum is a location and No. 7 Merchant is drilling at 3,375 feet. Same company's No. 4 fee is being rigged to deepen. Gulf Production Co.'s No. 87 Phoenix Development Co. is drilling at 3,100 feet. Gulf company's No. 29 Phoenix Development Co. is drilling at 3,700 feet and No. 10 W. L. Thomas fee is drilling at 2,930 feet. Hull Oil Co.'s No. 7 Harrison is being rigged to drill deeper. Empire Gas & Fuel Co.'s No. 27 Barngrover is drilling at 2,950 feet.

At North Dayton the Harrison Oil Co.'s No. 2 Quintette is drilling at 4,140 feet. Five miles east of Davis Hill Titwell and associates' No. 1 Gardner is shut down in gumbo at 3,508 feet. The Texas Company's No. 1 Harvard at Davis Hill is a rig. Two miles northeast of Cleveland Barlow and associates' No. 1 Mincheliff is drilling at 2,200 feet.

Montgomery County

Brains and associates' No. A-1 Fitch, 3 miles northwest of Spring, is drilling shale and boulders at 2,800 feet. West of Pinehurst Cordell and Lynn's No. 1 Nichols is drilling gumbo at 1,200 feet.

Matagorda County

Gulf Production Co.'s No. 3 Sanborn at Hawkinsville was dry and abandoned without a show at 4,750 feet. Rycade Oil Corp. and Humble Oil Co.'s No. B-2 Kountze at Markham was dry and abandoned at 4,033 feet in salty shale. At Bay City the Matagorda Development Co.'s No. 1 Hawkins is shut down in shale at 1,985 feet.

Orange County

Brownie Babbittee Oil Co.'s No. 1 Peveto is pumping 100 bbls. of fluid, 70 per cent water, from 3,175 feet. Sun Oil Co.'s No. 2 Brown is being rigged to drill deeper. Rycade Oil Corp.'s No. 11 State B is drilling at 4,110 feet. Texhoma Oil Co.'s No. 8 Chesson was dry at 3,025 feet and shut down; No. 16 Chesson is drilling at 3,725 feet. Sinclair Oil Gas Co.'s No. 4 Granger was dry at 3,300 feet and is shut down. Gulf Production Co.'s No. 19 Lee Hager fee is drilling at 4,125 feet. Gulf company's No. 3 Hager and Moore is being drilled deeper. Rex Petroleum Co.'s No. 6 Carbello is being rigged to drill deeper.

Walker County

Twenty miles northeast of Huntsville, Head and Thompson's No. 1 Thompson is washing to the bottom in shale at 2,210 feet.

Waller County

Seven miles east of Hempstead Fred Fulkinger's No. 1 Fulkinger is shut down in shale at 910 feet. J. R. Garrett and associates' No. 1 Garrett, 12 miles south of Hempstead, is drilling gravel at 520 feet.

Wharton County

On the Wharton side of Boling, Nail and associates' No. 1 Croom is drilling sandy lime at 450 feet. Southern Exploration Co.'s No. 1 Mullins is a derrick.

LOUISIANA GULF COAST

Ascension Parish

Gulf Refining Co.'s No. 3 United Lands Co. at Sorrento Dome is a location.

Calcasieu Parish

In the Lockport Field Vacuum Oil Co. and Gulf company's operations are as follows: No. 8 Miller is fishing at 4,400 feet. No. 3 Farquahar and others is drilling at 500 feet; No. 5 is drilling at 5,625 feet. No. 5 Bordages is being put on the pump at 3,750 feet. No. 1 fee-A is being swabbed at 3,850 feet. No. 4 Bayou d'Inde is a rig and No. 2 Frieberg and Wolf is drilling at 5,630 feet.

In the Edgerly Field the Rex Petroleum Corp.'s No. 5 Hunter is drilling at 4,000 feet. Hercules Oil Co.'s No. 3 Paraffine is drilling at 2,940 feet. McDaniels and Ellis' No. 1 Ecker is drilling at 3,675 feet. The strainer was set at 3,480 feet at Wilson-Broach's No. 5 Wilson. Gulf Refining Co.'s No. 3 Robert Lincoln fee is drilling at 2,875 feet and No. 10 Higgins-B is drilling at 2,675 feet. Plummer Oil Co.'s No. 1 Lyons is drilling at 3,075 feet. West Edgerly Oil Co.'s No. 1 Kranse and Managan is drilling at 1,450 feet.

At Stark Dome the Gulf Refining Co.'s No. 7 L. M. Lumber Co. is drilling gumbo and lime at 3,150 feet. Preparations are being made to core sand at 2,745 feet at Gulf company's No. 8 Industrial Lumber Co. At Sulphur the Union Sulphur Co.'s No. 721 fee came in flowing 150 bbls. of 21.7 gravity oil from 3,355 feet and is now being swabbed. Newton Drilling Co.'s No. 1 Dupre is drilling gumbo at 1,900 feet.

Cameron Parish

Pure Oil is pulling the strainer at No. 4 Sweet Lake in the Sweet Lake Field, total depth 5,141 feet. Preparations are being made to set 1½-inch strainer inside

the 3-inch at 5,100 feet at No. 2 Sweet Lake. At Hackberry Yount Lee Oil Co.'s No. 5 State Black Lake is coring sand at 4,835 feet with no oil or gas showing so far. Calcasieu Oil Co.'s No. 2 Caldwell, in the same area, is drilling gumbo and lime at 3,330 feet.

Iberia Parish

At Fausse Point the Gulf Refining Co.'s No. 1 Broussard is drilling gumbo at 4,224 feet. Gulf company's No. Z-3 State has been spudded.

La Fourche Parish

Gulf Refining Co.'s No. 1 Debert-Stark at Thibodeaux is drilling in hard sand at 1,296 feet and losing returns. The well is reported to be showing a little oil.

St. Martin Parish

Rycade Oil Corp.'s No. 1 Atchafalaya is drilling crystallized sand at 3,869 feet after topping the cap rock at 3,859 feet.

St. Mary Parish

Louisiana Exploration Co.'s No. 1 W. Cote Blanche is drilling gumbo at 2,523 feet.

New Locations

Six "first reports" were reported in the coastal region during the past week as follows:

Harris County—Pierce Junction: Rio Bravo Oil Co.'s No. 1 G. H. & S. A. R. R. right of way, 1,600 feet east from where railroad crosses west line of James Hamilton Survey, 35 feet south from center of track, location. No. 101 G. H. & S. A. R. R. right of way, 925 feet west from where railroad crosses east line of Williams Survey, 35 feet south from center of track, location. No. 7-A Settegast, 2,240 feet south, 125 feet east from northeast corner of "A" lease, location.

Jefferson County—Big Hill: Freeport Sulphur Co.'s No. 2 Staiti, Stephen Eaton Survey, 1,000 feet north, 800 feet west of Freeport Sulphur Co.'s No. 1 Staiti, location.

Liberty County—Hull: Empire Gas & Fuel Co.'s No. 27 Barngrover, Jesse Devore Survey, 290 feet east of west line, 310 feet south of north line, location.

Matagorda County—Markham: Rycade-Humble companies' No. 5 Charles Kountze, Henry Parker Survey, Block 23, 800 feet east, 600 feet south of northwest corner of block, location.

EFFECT OF GAS LIFT ON OIL IS UNCERTAIN

(Continued from Page 112)

tubing and casing. The use of larger diameter tubing if necessary to accommodate production rather than to flow between the tubing and casing is recommended. A control of flow velocity will also aid to minimize emulsion difficulties. Either too low or too high a velocity tends to increase the percentage of emulsion. Holding pressure at the trap will often accomplish good results. One objection to holding pressure at the trap is the evential loss in the higher or more volatile hydrocarbons which are held in solution in the oil and are later lost beyond recovery. While the ordinary types of flow nipples used at the well head tend to increase the percentage of emulsion, the new adjustable type has apparently eliminated some of this difficulty.

SEMINOLE AIR-GAS LIFT INSTALLATIONS

(Continued from Page 109)

shutting down of a well. The maximum capacity of a battery of compressors is not fully utilized when low working pressures are required.

Installation Costs

Development in the Seminole area was so rapidly that only approximate costs were available. Roughly, the small units consisting of three 9½ by 4 by 10-inch compressors cost $4,500 to $5,000 each of $13,500 to $15,000 per well. Eighty horsepower units consisting of two 9¾ by 5 by 20-inch compressors cost from $10,000 to $12,000 each or $20,000 to $24,000 per well. The 165 horsepower units consisting of one 15 by 7½ by 20-inch compressor cost $17,000 to $20,000 per well. These costs include everything in connection with installation of the plant up to the operating point.

Operation costs varied as to the manner in which they were computed. On a basis of cubic feet of gas handled, costs were about 9 cents per 1,000 cubic feet.

Summary

The Seminole Field has had the most intensive application of the air-gas lift of any field in the United States. The practice has been to follow general principles of application with elaborations along certain lines. In plant construction right angle bends have been eliminated as much as possible by using 45-degree bends or by bending the pipes in a special machine. Each plant is different in detail, the differences in construction being due to the engineer in charge. Companies are building several kinds of plants experimenting with each with respect to construction, equipment and operation with the idea of standardization in mind. When that point is reached, costs of construction and operation will be greatly reduced.

OKLAHOMA FIELDS

(Continued from Page 54)

feet. No. 3 Grayson, NW cor. NE NW Section 13-8-6, produced 635 bbls. from the Wilcox sand at 4,222-38 feet. Empire Gas & Fuel Co.'s No. 6 Lacey, NE cor. NW SW Section 14-8-6, found the top of the Wilcox sand at 4,263 feet, drilled through lime break to 4,373 feet and made 230 bbls. Magnolia Petroleum Corp.'s No. 1 Strothers, SE cor. NW Section 17-8-6, is dry and abandoned in the Wilcox sand at 4,427 feet. Empire Gas & Fuel Co.'s No. 3 Wise, SE cor. NW Section 23-8-6, is a dry hole at 4,700 feet.

Gypsy Oil Co.'s No. 1 Wakkie, SE cor. NE SW Section 35-8-6, has been abandoned at 4,292 feet. Indian Territory Illuminating Oil Co.'s No. 2 Dungan, NE cor. SW SE Section 35-8-6, was completed for 1,130 bbls. in the Wilcox sand at 4,341-4,345 feet. Gypsy Oil Co.'s No. 1 Campbell, SW cor. NW SE Section 36-8-6, made 1,575 bbls. from the Wilcox sand at 4,416-22 feet. Magnolia Petroleum Co.'s No. 3 Bagwell, SE cor. SW NW Section 32-8-8, had the Wilcox sand at 4,149-58 feet, plugged back to 4,141 feet and swabbed 70 bbls. from the Hunton. Indian Territory Illuminating Oil Co.'s No. 5 Soketheche, NE cor. NW NE Section 1-7-6, was completed for 1,379 bbls. by swabbing from the Wilcox sand at 4,202-10 feet. Tidal Oil Co.'s No. 1 Jackson, SE cor. NE NW Section 1-7-6, swabbed 1,165 bbls. from the Wilcox sand 4,432-39 feet. Indian Territory Illuminating Oil Co.'s No. 1 House "B," NE cor. SE Section 2-7-6, had the Wilcox sand at 4,375-81 feet and flowed 2,275 bbls. T. B. Slick's No. 1 Harjo, SE cor. SW SW Section 1-6-6, is dry and abandoned at 4,156 feet. Guy Swain and Wiser Oil Co.'s No. 1 Dindy, SE cor. Section 20-6-7, is dry and abandoned at 4,558 feet. The Prairie Oil & Gas Co.'s No. 1 Wilson, SW cor. NE NE Section 3-9-6, has been abandoned at 4,289 feet. No. 4 Gahagan, SW cor. SE NE Section 23-8-6, made 330 bbls. from the Wilcox sand at 4,220-49 feet.

Beckham County

Bucy & Clay's No. 1 Hawkins, NE cor. SW NE Section 21-9-23w, topped the gas sand at 2,615 feet, drilled to 2,705 feet and is good for 40,000,000 feet of gas.

Caddo County

Moran and others have the rig up for No. 1 Cutshall, NE cor. SE NW Section 5-5-9w. Rome, Moran & Jackson's No. 1 Parks, SE cor. NE NW Section 5-5-9w, is pumping 25 bbls. from 2,410 feet.

Creek County

Continental Oil Co. has a machine at the location for No. 1-A Unallotted, NE cor. Section 26-18-11, near Sapulpa. Olean Petroleum Co. made location for No. 2-A Harjo, SE cor. NW NE SW Section 13-17-8, and is skidding the rig over from No. 2. O. M. Irelan and others' rig is on the ground for No. 1 Thomas, SW cor. SE NW Section 13-17-10. Ted Ray Oil Co. has the rig on the ground for No. 2 Smiles, NW cor. NE SW Section 13-17-10, in the Kellyville Pool. Thompson & Black have a machine on the location for No. 5 Wilson, NW cor. SE SW, Section 16-17-11. Turner & Turner moved the rig out for No. 5 Penoke, NW cor. SW SW Section 9-16-12. Independent Oil & Gas Co. has the rig on the ground for No. 4 Wolfe, NE cor. SW NE Section 18-14-10. Producers & Refiners Corp. moved the rig out for No. 5 Harjo, NW cor. SE NE Section 18-14-10.

Redister Oil Co.'s No. 3 Murrell, C SE NW Section 17-19-9, drilled to 2,509 feet where water was encountered and the hole plugged back to 2,224-42 feet where it is making 10 bbls. Evans Brothers' No. 1-A Cares, NW cor. SE Section 31-19-9, was completed in the Dutcher sand at 2,480-87 feet for 10,000,000 feet of gas. Sapulpa Fuel Co.'s No. 1 Washington, NE cor. Section 19-18-9, has been abandoned at 2,990 feet without finding the sand. Kennedy & Horner and others' No. 1 Burnett, SW cor. Section 24-18-11, has been completed for 3,000,000 feet of gas in the Dutcher sand at 1,885-1,900 feet.

Dixie Drilling Co.'s No. 3 Bowlegs, NE cor. SE SE Section 1-17-9, was shot with 60 quarts in the Peru sand at 1,778-1,806 feet and completed for 20 bbls. O. M. Irelan's No. 3 Farley, NW cor. SE NE Section 13-17-10, is making 75 bbls. from the Red Fork sand at 1,869-89 feet. Ted Ray Oil Co.'s No. 6 Brink, NE cor. SE SW Section 13-17-10, had the Dutcher sand at 2,431-72 feet and is making 35 bbls. Thompson & Black's No. 4 Wilson, NW cor. SE SW Section 16-17-11, is a dry hole in the Glenn sand at 1,975-2,000 feet. Kawfield Oil Co.'s No. 1 Bowers, NE cor. NW SW Section 23-16-10, is dry and abandoned at 3,454 feet in the Wilcox sand topped at 3,062 feet. Future Development Co.'s No. 2 Behen, C SE NW Section 2-16-11, was completed for 25 bbls. in the Wilcox sand at 2,639-45 feet. Wilcox Oil & Gas Co.'s No. 3 Dixon, NE cor. NW SE Section 18-14-10, is a 600-bbl. well in the Wilcox sand at 3,393-3,411 feet.

Garfield County

Marland Oil Co. is rigging up rotary tools for No. 2 Garber, SW cor. NW SE Section 19-23-3w. The rig is being erected for No. 1 Rhoades, NW cor. NE NW Section 30-23-3w.

Charles E. Knox's No. 6 Crooks, NE cor. SE SW NE Section 26-22-4w, is dry and abandoned at 1,960 feet. No. 7 Crooks, SW cor. NE Section 26-22-4w, has been abandoned at 1,825 feet. No. 8 Crooks, NE cor. SW SW NE, Section 26-22-4w, was abandoned at 1,775 feet.

Grady County

Oklahoma Natural Gas Corp. made location for No. 3 Glover, NW cor. SE NE Section 27-5-8w. Hall & Briscoe made location for No. 5 Nation, NE cor. NW SE Section 34-3-5w.

Marland Oil Co.'s No. 1 Burke, SE cor. NE Section 17-3-5w, was completed for 85 bbls. in sand at 2,295-2,302 feet. Magnolia Petroleum Co.'s No. 4 Mitchell, SW cor. NE NW Section 34-3-5w, has been abandoned at 3,562 feet. Gant and others' No. 1 Pursley, SE cor. NW Section 17-4-6w, was completed for 11,000,000 feet of gas in sand at 1,814-24 feet. The Prairie Oil & Gas Co.'s No. 6 Russell, NW cor. NE NW Section 21-3-5w, made 30 bbls. from sand at 2,138-52 feet.

Grant County

Argo Oil Co. made location for No. 2 Swaggart, SE cor. Section 15-27-3w. Deer Creek Field. Washoma Oil Co. and Roxana Petroleum Corp. moved a rig out for No. 1 School Land, NW cor. SW Section 36-28-3w.

Harper County

A. F. Kopisch Oil Co.'s No. 1 Selman, NE cor. SE Section 24-27-21w, has spudded and shut down.

Jefferson County

Denton, Lash & McCall have a rotary rig up for No. 1 Trout, SE cor. NE SE Section 18-7s-5w.

Kay County

Harris & Haun made location for No. 3 Henzel, NE cor. SW Section 15-29-1w. Vernon Oil & Gas Co.'s No. 6 Brockhouser, NW cor. SW SE Section 17-29-1e, is drilling at 710 feet. Blackwell Oil & Gas Co.'s No. 5 Kumler, C SW SE Section 9-27-1w, Blackwell Field, is drilling deeper at 3,444 feet.

Larutan Fuel Co.'s No. 4-A Woods, SE cor. NE NW Section 30-27-1w, has been abandoned at 802 feet. Anderson & Peterson"s No. 1 Myer, SW cor. SE SW Section 31-27-2e, is dry at 651 feet. Comar Oil Co.'s No. 1 Garrett, NE cor. NW SE Section 31-27-2e, was completed for 49 bbls. in sand at 2,456-65 feet.

Lincoln County

Empire Gas & Fuel Co. has a machine on the ground for No. 2-A Ward, NE cor. Section 33-17-4. Indian Territory Illuminating Oil Co. made location for No. 2 Lindsey, NE cor. Section 6-16-5.

Carter County

Wirt Franklin and the Prairie Oil & Gas Co.'s No. 6 Pruitt, NE cor. NW NW Section 4-2s-3w, had a series of sands from 2,280 feet to 2,921 feet, drilled to 3,100 feet and made 15 bbls.

Hughes County

Noble Oil & Gas Co. and others made location for No. 1 Wicket, SE cor. Section 20-5-9.

Muskogee County

A. A. Lang has a machine on the location for No. 1 McIntosh, SW cor. NE SW Section 20-15-18. Sunray Oil Co.'s No. 1 Hicks, NE cor. SW Section 5-14-19, is spudding.

J. R. Parks' No. 1 Vann, NW cor. SW SE Section 24-15-19, is dry and abandoned at 1,866 feet. Sunray Oil Co.'s No. 9 Crittenden, NW cor. SW Section 5-14-19, was completed for 40 bbls. in sands at 706-21 feet and 724-42 feet. Sioux Oil Co.'s No. 3 Kelly, CNL NE NW Section 24-13-18, has been shut in for 1,000,000 feet of gas in sand at 512-40 feet.

Okfuskee County

J. Hartman's No. 1-A Holmes, NW cor. NE NE Section 27-12-11, is dry and abandoned at 2,808 feet. L. W. Umburn's No. 2 Fields, SW cor. NW Section 31-10-12, was drilled to 3,055 feet and abandoned.

Okmulgee County

Kirkland & Son's No. 2 B. Long, CNL NE NE Section 18-15-13, is drilling at 1,000 feet. Hutchinson & Becker's No. 4 Doyle, SW cor. SE NW Section 6-14-13, is drilling at 500 feet. Sperry & Son's No. 6 Lacey, CNL SW SW Section 7-14-13, is drilling at 300 feet. Sharpe & Ellinger's No. 4 Colbert, CWL NE NW Section 16-14-14, is rigging.

Harsha & Delaney's No. 2 Bruner, CSL SW NE Section 34-16-14, has been completed for 10 bbls. in the Dutcher sand at 1,859-77 feet. Misner and Mid-Continent Petroleum Corp.'s No. 1 Lowery, NE cor. SW Section 10-15-14, was shot with 80 quarts and completed for 40 bbls. in sand at 983-99 feet. W. B. Pine's No. 1 Skidmore, SE cor. NW, Section 10-15-14, is making 15 bbls. from sand at 978-94 feet. J. E. Wallace's No. 3 Colbert, CSL NW SE Section 14-14-14, is producing 10 bbls. from sands at 986-96 feet and 1,001-9 feet. McNutt & Davis' No. 1 Eubanks, SW cor. NE NE Section 17-13-14, made 2 bbls. from sand at 1,218-29 feet. Tiger Mountain Oil Co.'s No. 1 Simer, NE cor. Section 19-12-13, is dry at 2,982 feet.

Pontotoc County

Max Westheimer is building the rig for No. 1 Wade, NE cor. SW NE Section 19-5-8. Homaokla Oil Co.'s No. 2 Milner, NW cor. SW NW Section 16-5-8, is making 90 bbls. from sand at 2,460-99 feet.

Logan County

Champlin Refining Co. is digging cellar and ponds for No. 1 Musgrove, SE cor. SW Section 8-19-4w, near Marshall.

Osage County

Winona Oil Co.'s No. 2, SE cor. SW NW NW Section 17-29-11, is drilling at 950 feet. Peters Petroleum Co. made location for No. 8, SE cor. NW Section 17-27-6, Burbank Pool. Kewanee Oil & Gas Co. is building the rig for No. 10, NW cor. SE NW Section 34-27-6. Indian Territory Illuminating Oil Co. made location for No. 378, NW cor. SE NE Section 29-26-11. Marland Oil Co. made location for No. 3, NE cor. SE Section 27-25-9. Galt Brown Oil Co. has the rig on the ground for No. 1, NW cor. NE Section 7-24-8. George Tselos is rigging up a machine for No. 3, NW cor. SW NE Section 11-24-11. Devonian Oil Co. made location for No. 2, SW cor. NE NE Section 33-21-10. Elliott &

Smith staked the location for No. 13, NW cor. SE SW Section 20-21-12. Oklahoma Natural Gas Corp. made location for No. 776, SE cor. NW NE Section 33-21-12.

Pawnee County

Magnolia Petroleum Co.'s No. 1 Winears, NE cor. NW Section 10-22-4, is dry and abandoned at 4,745 feet. Garber & Pulse's No. 1 Moore, SW cor. NW Section 9-22-6, is dry and abandoned at 3,525 feet.

Tulsa County

Sand Springs Home's No. 2 Gates, C N half SE NE Section 4-19-11, is spudding. Lockwood and others moved a machine out for No. 1 Jones, NW cor. NE NW NE Section 15-19-11. Suppes and others' No. 4 Smith, NW cor. SW Section 5-17-13, is spudding. S. W. Anthony has the rig up for No. 8 Sanderson, CNL NW Section 3-16-12.

Sheridan Oil Co.'s No. 3 Russell, SE cor. NE NE Section 27-19-11, has been completed for 2,000,000 feet of gas in the Burgess sand at 1,787-92 feet. Hivick and others' No. 1-A Unallotted, NW cor. SW NW Section 14-18-12, is a dry hole at 2,212 feet.

Stephens County

Dameron and others' No. 1 Florence, NE cor. NW SE Section 11-3s-6w, is on top of a gas sand at 340 feet where the 10-inch casing is being run. Tuohy and others' No. 1 Edwards, NE cor. NW NE Section 10-3s-5w, is drilling at 500 feet.

Owen & Wood's No. 3 Massey, NW cor. SE NW Section 12-2s-8w, was completed for 50 bbls. in sand at 2,071-79 feet. Magnolia Petroleum Corp.'s No. 1 Harrell, NE cor. SW SW Section 3-1n-5w, is making 6,000,000 feet of gas from sand at 3,720-25 feet. No. 1 Creel, NW cor. NE SE Section 31-1-5w, has been abandoned at 2,312 feet. No. 1 Payne, SE cor. NE Section 31-1-5w, was completed for 5 bbls. in sand at 1,860-67 feet. Magnolia Petroleum Corp. has the rig up for No. 1 Martin, SE cor. SW NE Section 13-1s-4w.

Wagoner County

Shaffer Oil & Refining Co. has a machine at the location for No. 1 Dan, NE cor. SW NW Section 21-17-15. Cartwright & Kyle's No. 4 Luckey, CSL SE SW Section 11-18-15, is dry and abandoned at 1,480 feet. W. R. Rowland and others' No. 1-A Johnson, SE cor. SW SE Section 31-18-15, has been abandoned at 1,355 feet. C. R. Cane and others' No. 1 Barnett, SW cor. NE Section 36-17-17, is a dry hole at 850 feet.

ADDITIONAL RATE INCREASES ANNOUNCED

(Continued from Page 50)

from St. Louis contend that the rates from the Mid-Continent Field to Chicago and other Illinois destinations have an important bearing upon the rates from Illinois points, and that the low measure of the former rates, due to the fact that only 5 cents higher than those to St. Louis, have held down the rates within Illnois as well as the rates prescribed to destinations in Indiana in Indiana State Chamber of Commerce vs. A. T. & S. F. Ry. Co., 112 I.C.C. 481. These defendants point out that if we had used the same basis in fixing rates to Chicago as to St Louis in 1915, the rate to Chicago would have been 30 cents instead of 25 cents, and that the rate today would be 42 cents. They further show that if the petroleum rates had been subjected to the 25 per cent increase in 1918, instead of the flat 4.5-cent increase, this rate would now be 46.5 cents and that the ton-mile earnings under the present rate to St. Louis would produce a rate to Chicago of 47 cents.

"They also point out that the ton-mile earning under the rate of 39 cents found reasonable in the original report from Group 3 to Chicago is less than that under the reasonable maximum rate of 46.5 cents prescribed from Group 3 to destinations in eastern Indiana for an average distance of about 775 miles. It is contended on behalf of these carriers that any reduction in the rates from the Mid-Continent Field to central territory will bring about a reduction in the rates within that territory and that in view of the bearing which the rates from the Mid-Continent Field to Chicago have on the rates to central territory, we should join this proceeding with the general investigation instituted in No. 18,458 and in No. 17,000, part 4, and fix the rates to Chicago at such level as may be justified by that record."

The commission dismissed with little comment the contentions of the North Texas and Shreveport (North Louisiana) and El Dorado (Arkansas) refiners who had sought to obtain more favorable freight rates to western trunk line points. The present North Texas differential of 2½ cents, under Group 3, was continued and the El Dorado and Shreveport refiners were left on a parity with Group 3 in their shipments to Illinois and southeast Wisconsin. In regard to Group 1 (Kansas City refiners), the only change made was the increase in the differential under Group 3 from 7 to 8 cents to St. Louis.

Wells in Yates Pool Average 244 Bbls. In One Hour's Gauge

MIDLAND, Tex., Oct. 15.—A one-hour proration gauge on eight recently drilled wells in the Yates Pool, Pecos County, resulted in the following production: Roxana Petroleum Corp.'s No. 1 Tippett, 203 bbls.; Simms Oil Co.'s No. 1 Smith, 153 bbls.; McMan Oil Co.'s No. 1, 302 bbls.; same company's No. 3, 90 bbls.; same company's No. 4, 112 bbls.; California Co.'s No. 1 Smith, 421 bbls.; same company's No. 1 Yates, 567 bbls.; Gulf Production Co.'s No. 1 Smith, 90 bbls. The eight wells averaged 244 bbls. per well in the hour or at the rate of 5,856 bbls. per day per well.

KERN COUNTY LEASE SALE

WASHINGTON, D. C., Oct. 15.—The Department of the Interior has authorized the offering of oil and gas leases in the Kern River oil field, Kern County, California, to the highest bidders at public auction at Sacramento, Calif., at 11 o'clock a.m. on Tuesday, November 15. The tracts to be leased are described as follows: Unit No. 1, Township 28s, Range 27e, Section 14, W half SE. 80 acres; unit No. 2, Township 28s, Range 27e, Section 22, NE, 160 acres; unit No. 3, Township 28s, Range 27e, Section 22, NE SW, 40 acres.

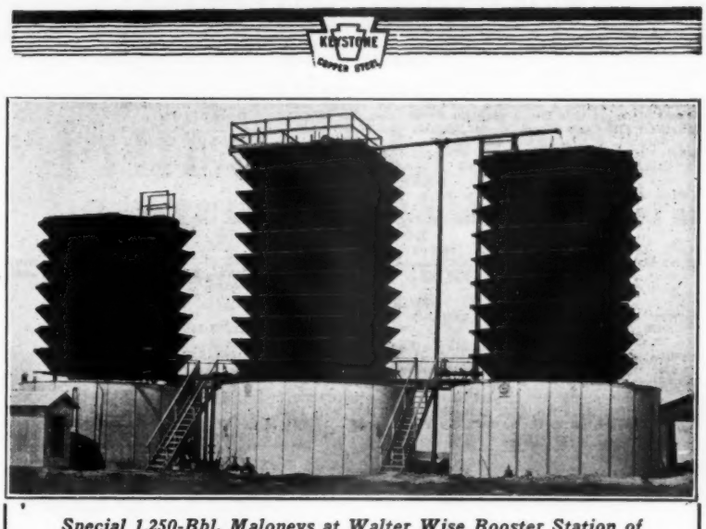
There has recently been considerable drilling in the vicinity of these tracts.

CONSIDER ACCOUNTING

M. W. Mattison, director of accounting for the American Petroleum Institute and general chairman of the committee on Uniform Methods of Oil Accounting, is expected to arrive in Los Angeles, Calif., to confer upon a detailed chart of revenue and expense accounts, a general income statement and a classification of fixed assets for the major divisions of the industry. Rodney S. Durkee, comptroller of the General Petroleum Corp., of California, and chairman of the Pacific Coast regional group of the committee on Uniform Methods of Oil Accounting of the Institute, will preside at the local meeting to be held in Los Angeles.

DANA WALTERS KILLED

CASPER, Wyo., Oct. 15.—Dana Walters, counted as one of the most careful shooters in the nitroglycerin business, was killed near Shelby, Mont., yesterday morning, when a magazine let go. Mr. Walters was born in Oil City, Pa. As a boy he played around the wells that used to produce oil inside the city limits and when a young man he learned the nitro business under the Hall Brothers in Oil City.



Special 1,250-Bbl. Maloneys at Walter Wise Booster Station of Carter Oil Company at Bowlegs.

EXTRA YEARS OF SERVICE—at NO EXTRA COST

MALONEYS are the longest lived bolted steel tanks because they are made of the most durable sheet steel known—rust-resisting Keystone Copper Steel. Yet they cost no more than other tanks. Their extra years of service cost the operator nothing.

All MALONEY Tanks have our patented "crimp" which promotes accurate fit of parts. Our special rubber packing and Gaso cement render all joints gas-tight. Seams are strongly reinforced with heavy steel channels. Our new bolts of 80,000 lbs. tensile strength are used—30% stronger without extra cost. Our Special Pearl Gray Paint is scientifically applied with a fine spray. Large cleaning out plates are set flush with bottoms. Valve equipment is the best to be had.

"Alone in Quality"

MALONEY TANK MFG. COMPANY
Tulsa, Okla.

Distributors at All Principal Petroleum Points

Sizes: 12 to 10,000 Barrels.

Packed in Steel-Bound Crates for Export

Howell Aluminum "3-in-1" Vacuum Pressure Valve and Thief-Hatch—The BEST and LATEST Deck Equipment—POSITIVE Safety.

MADE OF KEYSTONE COPPER STEEL

MALONEY PATENTED BOLTED COPPER-STEEL TANKS

MADE OF KEYSTONE COPPER STEEL

MALONEY

ALONE!

WILDCAT OPERATIONS IN PANHANDLE

(Continued from Page 48)

COTTLE COUNTY

Exploration Co.'s No. 1 Richards .... Spudded and S.D.

DALLAM COUNTY

James et al's No. 1 fee, Sec. 9, 47½ .... S.D., 2,870 ft; temp. abd.
Wood Bros. et al's No. 1 Capitol Synd., Sec. 19, Blk. 17.. S.D., 3,970 ft.
Marland Oil Co.'s No. 1 A. M. James, C SW W half, Sec. 21, S. H. McElreath Sur. .... T.D., 1,800 ft; U.R., 10-in.
Marland Oil Co. et al's No. 1 Capitol Synd., Sec. 36 Blk. 18, Capitol Synd. land .... Fish., 2,480 ft.

DEAF SMITH COUNTY

Julien & DeGrace's No. 1 Mrs. R. A. Hindley, Sec. 47, Blk. K-8 .... S.D., 520 ft.
Red Hill Oil Corp.'s No. 1 Barrett, Sec. 93, Blk. K-4.... S.D., 710 ft.

DONLEY COUNTY

A. T. Drlg. Co.'s No. 1 F. E. Harington, Sec. 39, Blk. 3-C .... 1,200 ft. water, 3,115-32 ft; show gas, 3,140-60 ft; dry granite wash, 3,260-93 ft; S.D., 3,498 ft.

DICKENS COUNTY

Bowser Mickels et al's No. 1 Pitchford ranch, Sec. 1, Blk. 1, Sam Lazarus Sur. .... S.D., 3,355 ft; cor. depth; T.A.

FLOYD COUNTY

Expltn. Co.'s No. 1 S. H. Boone, C. C. H. Johnson Sur... Spudded and S.D.
Expltn. Co.'s No. 1 Land & Cattle Co. .... S.D., 780 ft. for orders.
Hoffer Oil Corp.'s No. 1 Nelson.... New location.

GRAY COUNTY

Amogray Oil Co.'s No. 1 A. Chapman, SW NW SW, Sec. 9, Blk. 24, H. & G. N. Sur. .... 2,000,000 ft. gas, 2,150-55 ft; 15,000,000 ft. gas, 2,240 ft; granite wash, 2,610-15 ft. and 2,623-25 ft; will flow 120 bbls. daily; T. D., 2,647 ft; cmt. 6-in., 2,520 ft.
Archer, Blake et al's No. 1 Turneau, Sec. 111, Blk. 2-B.. Spudded and S.D; temp. abd.
Amos et al's No. 1 Crews, NW cor. Sec. 9, Blk. 25.... Shot with 300 qts., 2,720-2,815 ft; T.D., 3,005 ft., bridged and spraying 10 bbls. per day; C.O. to pump.
Bay Shore Oil Co.'s No. 1 C. W. Bradford, Sec. 142, Blk. 2-B .... T.D., 2,666 ft; try to drill by bit.
British American Oil Co.'s No. 1 J. M. Patton, Sec. 61, Blk. B-2 .... Rigged and S.D.; temp. abd.
Camel Oil Co.'s No. 1 Harrah, Sec. 163, Blk. 3, I. & G. N. Sur. .... Drlg., 2,585 ft.
Camel Oil Co.'s No. 1 B. E. McKinney.... New loc.; rig on ground.
Clark et al's No. 1 Jackson, NE cor. W ½ SW, Sec. 88, Blk. B-2 .... Driving 20-in., 185 ft.
Clark et al's No. 2 Jackson, NW cor. S ½ NE, Sec. 88, Blk. B-2 ....
Clark et al's No. 3 Jackson, SW cor. S ½ NE, Sec. 88, Blk. B-2 .... Rig.
Cole O. & G. Co.'s (was Magdalene Oil Co.'s) No. 1 J. E. Williams, Sec. 17 Blk. 1 .... S.D., 3,860 ft.
Danciger et al's No. 2 W. Jackson, SW SE NW, Sec. 88, Blk. B-2 .... Drlg., 250 ft.
Danciger et al's No. 3 W. Jackson, SE SW NW, Sec. 88, Blk. B-2 .... Rigging up rotary.
Danciger et al's No. 1 Jackson, NW cor. Sec. 88, Blk. B-2. Set 8-in., 2,477 ft; show gas, 2,530-2,625 ft; 10,000,000 ft. gas, 2,652-2,800 ft; flowing 35 bbls. per hr; 3,000-32 ft.
Donley Gray Oil Co.'s No. 1 J. W. Gordon, Sec. 79, Blk. 3 .... Water, 3,380 ft. and 3,430 ft; show oil; S.D., 3,460 ft.
Jack Doyle's No. 1 D. W. Osborne, SE cor. Sec. 109, Blk. 3 .... Rig.
Delavey et al's No. 2 Jackson.... New loc.; bldg. rig.
Edwards et al's No. 1 E. J. Case, NE cor. Sec. 182, Blk. B-2, H. & G. N. Sur. .... 70,000,000 ft. gas, 2,625 ft; S.D., 2,670 ft.
Empire G. & F. Co.'s No. 1 Sarah George, Sec. 151, Blk. 3, I. & G. N. Sur. .... Drlg., 2,475 ft.
Gibson Oil Corp.'s No. 2 J. B. Bowers.... Fish. pipe, 2,910 ft.
Lefors Pet. Co.'s No. 1 Leach, Lefors Townsite.... 10,000,000 ft. gas, 2,440-50 ft; fish., 2,550 ft.
H. C. McCauley et al's No. 1 J. Morse, Sec. 2, Blk. 46, H. & G. N. Sur. .... Rigging up.
Neudigate et al's No. 1 A. Chapman, NE cor. E half SE Sec. 52, Blk. 25 .... 500,000 ft. gas, 2,760-65 ft; rainbow of oil, 2,820-25 ft; salt water; granite wash, 2,827-28 ft; S.D., 2,835 ft.
Operators Oil Co.'s No. 1 Jackson.... Drlg., 300 ft.
Operators Oil Co.'s No. 2 Bowers, NE cor., Sec. 35, Blk. 3, I. & G. N. Sur. .... S.D. for repairs, 2,990 ft.
Pampa Oil Co.'s No. 1 W. R. Campbell, Sec. 90, Blk. 3... 700 ft. water, 3,430 ft; S.D.
Riley & Heck's No. 1 Mrs. Hopkins, Sec. 66, Blk. 2-B... Flow and swabbed 20 bbls. for week from gran. wash, 3,000-10 ft; T.D., 3,305 ft; temp. abd. but not plugged.
Remo Oil Co.'s No. 1 B. E. McKinney.... New location.
Rensoul Pet. Co.'s (was Salisbury & Reynolds') No. 1 M. Huselby, C SE NE NE Sec. 55, Blk. 25, H. & G. N. Sur. .... Flowing 30 bbls. daily; T.D., 2,959 ft; will deepen.
C. B. Shafer's No. 1 G. Cole.... S.D. for orders, 3,313 ft.
Shamrock Pet. Co. et al's No. 1 J. B. Back, SE NW SW, Sec. 44, Blk. 25 .... Drlg., 1,200 ft.
Skelly Oil Co.'s No. 1 W. Jackson.... New loc.; bldg. rig.
Sullivan et al's No. 1 A. Chapman.... Rig on ground.
Sullivan et al's No. 1 A. Chapman-A.... Rig.
Staggers Oil Co.'s (was Ruby Oil Co.'s) No. 1 B. F. Tally. S.D., 635 ft. to deepen.
Navillus Oil Co.'s (was Sullivan et al's) No. 1 fee, NW cor. E ½ SW, Sec. 1, Blk. 1, A. C. H. & B. Sur..... 3,000,000 ft. gas, 2,170-80 ft; 30,000,000 ft. gas, 2,240-90 ft; drlg., 2,345 ft.
The Texas Company's No. 1 A. Chapman, Sec. 51, Blk. 25. Spudding.
The Texas Company's No. 1 W. J. Brown.... Drlg., 3,575 ft; 1,000 ft. wtr., 3,540-45 ft.
J. Williams et al's No. 1 C. W. Bradford, Sec. 123, Blk. B-2 .... Rig on ground.

HALE COUNTY

Bailey & Young's No. 1 Thomas, Sec. 1, Blk. J.K.L..... Drlg., 175 ft.
Donnell Pet. Co.'s No. 2 Mullican, NW cor. Sec. 66, Blk. A-3, I. & S. B. Sur. .... Top pay in sandy shale, 405 ft; ½ bailer oil and 3 bailers water per day; S.D., 525 ft.
Donnell Pet. Co.'s No. 1 Mullican, C Sec. 21, Blk. B, R. M. Thompson Sur. .... 200 ft. fluid in hole from 407-14 ft; S.D.
Exploration Co.'s No. 1 Crawford, cen. NE, Sec. 17, Blk. C-3, T. T. R. R. Sur. .... Spud and S. D.
Exploration Co.'s No. 1 fee, C SE half Sec. 19, Blk. S-4, D. & S. E. Sur. .... Rig; T.A.
Exploration Co.'s No. 1 Goodman .... Spudded and S.D.
A. S. Mimm's No. 1 W. A. Ritcher, 700 ft. from east line and 1,300 ft. from south line, Sec. 17, Blk. X, John Glynn Sur. .... Drlg., 925 ft.
Tolbert & Simms' (was Gouldy & Stone's) No. 1 Kitteral, SE cor. NW, Sec. 65, Blk. A-3, G. C. & S. F. Sur. .... Drlg., 255 ft.

HALL COUNTY

Seifert et al's No. 1 Owens, C NE Sec. 179, Blk. S-5, Dennison & Pacific Sur. .... Spudded and S.D.

HANSFORD COUNTY

Caldwell et al's No. 1 J. Adriance estate .... T.D., 585 ft; rigging up. (This well was temp. abd. in April.)
Oklavania et al's No. 1 Coots, Sec. 13, Blk. 45, H. & T. C. Sur. .... S.D., 560 ft.

HOCKLEY COUNTY

World Oil Co.'s No. 1 Ellwood .... T.D., 1,035 ft; reaming.

HARTLEY COUNTY

Deep Rock Oil Co.'s No. 1 Lymann & Balfour, Sec. 9 Blk. 2 .... Show gas and rainbow of oil, 1,560 ft; top lime, 2,610 ft; 34,000,000 ft. gas, 3,100-3,240 ft; show oil, 3,648-50 ft; 3,653-75 ft. 150 ft. salt water; set 6-in. 3,649 ft; S.D., 4,038 ft.
Eslick et al's No. 1 J. R. Irving, Sec. 13, Blk. 13.... Topped granite wash, 3,108 ft; show oil, 3,226 ft; hole full wtr., 3,745-55 ft; drlg., 3,780 ft.

HEMPHILL COUNTY

Hoover et al's No. 1 Schaller est., Sec. 4 .... Spudded and S.D.
Hoover et al's No. 1 fee, J. S. Hood Sur. .... Fish. liner, 4,771 ft.

HUTCHINSON COUNTY

Anderson & Pritchard's No. 2 William Yake, SW cor. NW, Sec. 1, Blk. J, H. & G. N. Survey, half mile W of No .1 .... Topped lime, 2,025 ft; set 8-in. at 2,030 ft; show gas, 2,495 ft; 10 bbls. oil and 50 bbls. water, 2,778-2,825 ft; salt water, 2,815-25 ft; S.D., 3,052 ft.
R. G. Barnum et al's No. 1 Garland Sanford, Sec. 78, Blk. 46 .... Rig.
Beam et al's No. 1 Cockrell, Sec. 3, Blk. 33 .... S.D., 405 ft. for orders.
Big Coach Oil Co.'s No. 1 Dunnaway, Sec. 5, Blk. Y.... S.D., 750 ft.
Conklin et al's No. 1 Johnson, Sec. 1, Blk. X03, H. & O. B. Sur. .... S. D., 600 ft. for 12-in.
Great Plains Oil Co.'s No. 1 Bivins, Sec. 13, Blk. Y-2, T. T. R. R. Sur. .... 60,000,000 ft. gas, 2,540-60 ft; fish., 3,190 ft.
Golden Eagle Oil Corp.'s No. 1 J. Q. Bost, Sec. 6, Blk. Y-2 .... Spudded and S.D.
McMan O. & G. Co.'s No. 1 Albert Yake .... Set 8-in., 1,900 ft; fish.
Panfield Oil Co.'s No. 1 Luginbyhl Bros., Sec. 50, Blk M-23 .... S.D., 1,200 ft.
Phillips Pet. Co.'s No. 12 Elva-Whittenburg, E. Tomlinson Sur .... Set 5-in., 4,323 ft; S.D. for orders, 4,445 ft.
Prairie O. & G. Co. and Vacuum Oil Co.'s No. 2 Cal Merchant .... New location.
Skyrocket Oil Co.'s No. 1 Mrs. R. A. Jameson.... S.D., 2,519 ft.
Sweeney et al's No. 1 Johnson, Sec. 38, Blk. Y.... Shut down, 1,780 ft.
The Texas Company's No. 1 Ellis Cockrell, Sec. 1, Blk. Y .... Drlg., 4,090 ft.
The Texas Company's No. 1 Cockrell-B .... Spudding.
Vitek Oil Co.'s No. 1 W. F. Allen, Jose Rodrigues Sur.... S.D., 180 ft.

KING COUNTY

Humble O. & R. Co.'s No. 1 Pitchfork, Sec. 171, Blk. A-96, John H. Gibson Sur. .... S.D., 1,210 ft.
Midwests' No. 1 Patton .... Drlg., 3,200 ft.
J. L. Pattison's No. 1 Patton .... Slight show gas, 2,115-30 ft; T.D., 2,673 ft; U.R.
White Eagle's No. 1 Burnett estate.... S.D. for 5-in., 3,440 ft.

LAMB COUNTY

Dan Freel et al's No. 1 Ellwood, CWL, Sec. 9, Blk. T, T. A. Thompson Sur. .... Location.
Tolbert & Simms' No. 1 Elwood, NE SW SW, Sec. 14, Blk. B., R. M. Thompson Sur. .... S.D., 712 ft.

LIPSCOMB COUNTY

Cal-Tex's No. 1 Bradford, C NE NE Sec. 399, Blk. 43, H. & T. C. Sur. .... Spudded and S.D.
Camp Creek Oil Co.'s No. 1 Mrs. H. D. May, Sec. 612, Blk. 43 .... S.D., 1,400 ft.
McCorkle's No. 1 A. Barton, NE cor. SW SE Sec. 504, Blk. 43, H. & T. C. Sur. .... Water in lime at 4,126-40 ft; 6-in. set, 4,155 ft; S.D., 4,200 ft.
Ozark Drlg. Co.'s No. 1 Frass, NE SE Sec. 106, Blk. 10, H. & T. C. Sur. .... Rig on ground.
Smith, Kinsley & Ruby's No. 1 C. W. Jones, NE cor. SW, Sec. 100, Blk. 43 .... Show oil, 3,520 ft; salt water at 3,900 ft; S.D.

LUBBOCK COUNTY

Center Oil Co.'s No. 1 Bowles ranch.... Small show oil, 1,133-40 ft. in sand; S.D., 1,225 ft.

MOORE COUNTY

A. O. Duggan's (was Shadler Bros.') No. 1 John Lowery, Sec. 237, Blk. 44 .... Topped lime, 2,680 ft; set 8-in. at 2,770 ft; 4,000,000 ft. of gas, 3,980-3,020 ft; 15,000,000 ft. gas, 3,100-50 ft; (actual gauge); S.D., 3,605 ft; very slight show oil in lime; drlg., 3,615 ft.
Prairie and Shamrock's No. 2 Gober, Sec. 16, Blk. M-21.. Drlg., 2,425 ft.
Skelly Oil Co.'s No. 1 Armstrong & Byrd.... Was completed for 100 bbls., at 3,179-3,213 ft. in August; to be deepened.

MOTLEY COUNTY

Exploration Co.'s No. 1 Burleson .... Spudded and S.D.
Exploration Co.'s No. 1 Tillson .... S. D., 750 ft. for repairs.
Exploration Co.'s No. 1 Matador Land & Cattle Co., cen. SW, Sec. 37, John Gibson Sur. .... Spudded and S.D.
Wheeler et al's No. 1 C. D. Bird, C NE Sec. 4, Blk. S, Stephens Sur. .... Spudded and S.D.

OCHILTREE COUNTY

W. G. Burton's No. 1 Stickler, Sec. 579, Blk. 43.... Fish. 2 joints pipe, 2,949 ft.
Hamilton et al's No. 1 R. E. Wamble, Sec. 144, Blk. 43.. S.D., 250 ft.
McCorkle Pipe Line Co.'s No. 1 R. H. Moore, Sec. 471, Blk. 43 .... S.D., 1,600 ft.
McCorkle's No. 1 Weinett, Sec. 674, Blk. 43 .... S.D., 850 ft.
Standard Dec. Co.'s No. 1 Bowden, Sec. 923, Blk. 43..... S.D., 900 ft.

OLDHAM COUNTY

Prairie O & G. Co.'s No. 1 Landegrin, SE cor. NE SW Sec. 46, League 310, Capital land .... 1,900 ft. wtr., 4,085-93 ft; 1 bailer wtr. per hr. and light scum oil, 4,527 ft. (steel line meas.); cmt. 6-in., 4,442 ft; drlg., 4,700 ft.

PARMER COUNTY

Humble O. & G. Co.'s No. 1 Farwell; elev. 4,005 ft..... Temp. abd., 3,600 ft.

POTTER COUNTY

Amarillo Oil Co.'s No. 1-B Masterson, Sec. 43, Blk. G-M-3, G. & M. Sur. .... 500,000 ft. gas, 1,750 ft; drlg., 1,950 ft.

ROBERTS COUNTY

Big Bend Oil Co.'s No. 1 Mrs. H. Ledrick & Sons, Sec. 7, Blk. 5-A .... Show gas, 4,990 ft; show oil, 4,992 ft; cas. set at 4,993 ft; S.D., 5,085 ft.
Murphy et al's No. 1 Gill, Sec. 31, Blk. M-2 .... S.D., 650 ft.
Roco Oil Co., formerly Charles Page et al's No. 1 W. T. Hammon, Clay County school lands .... Spud. and S.D.
C. C. Wilson, No. 1 A. H. Tandy, NE cor. Sec. 182, Blk. 42, H. & T. C. Sur. .... Spud. and S.D.

SHERMAN COUNTY

Gibson Oil Co.'s No. 1 Bivins, Sec. 35, Blk. 3-B..... 100,000 ft. gas, 2,016-26 ft; drlg., 2,550 ft.
Hagy & Harrington and Marland Oil Co.'s No. 1 S. F. Flores, C SW Sec. 64, Blk. 3-T, T. & N. O. Sur. .... 8-in., 2,726 ft; 500,000 ft. gas, 3,048-50 ft; 1,200 ft. water, 3,145-50 ft; S.D., 4,003 ft.
Phillips Pet. Co. and Prairie O. & G. Co.'s No. 1 Price & Fuqua, C NE, Sec. 33, Blk. 2-B, G. H. & H. Sur... 100,000 ft. gas 2,105-10 ft; drlg., 2,400 ft.

WHEELER COUNTY

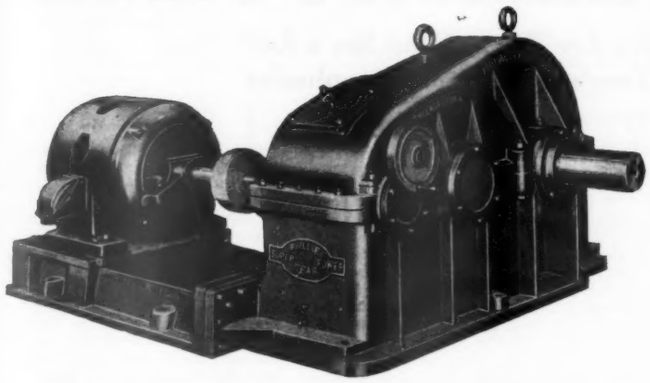
E. L. Arnold's No. 1 M. J. Williams.... Show gas, 1,644 ft; drlg., 1,780 ft.
Byrens et al's No. 1 Johnson, SW cor. NE, Sec. 88, Blk. A-5, H. & G. N. Sur. .... Location.
Foster et al's No. 1 S. H. McDonald, SE cor. NW SW, J. N. Lindsay Sur. .... Spudded; repaired rig.
Hatcher et al No. 1 J. Hatcher, cen. NE SW Sec. 80, Blk. 33, H. & G. N. Sur. .... T.D., 1,460 ft; 1,000,000 ft. gas; cmt. 6-in.
Marland Oil Co.'s No. 2 W. E. Bentley .... S.D. by agreement, 2,277 ft.
Piney Oil & Gas Co.'s No. 1 M. E. Ackley, C NW NW Sec. 20, Blk. 24, H. & G. N. Sur. .... Drlg., 1,885 ft.
Piney Oil & Gas Co.'s No. 1 W. S. Walker, Sec. 44, Blk. 24, H. & G. N. Sur. .... T.D., 3,280 ft; show gas; dropped 8-in. 25 ft; fishing.
Smith Brady et al's No. 1 P. J. Sorenson, Sec. 53, Blk. A-4 .... S.D., 2,120 ft. for orders.
The Texas Company's No. 1 Morgan, Sec. 98, Blk. 17.... S.D. for boiler repairs, 1,525 ft.

"Pump More Oil with *Less Power and Lower Upkeep Cost*"

with a

PHILADELPHIA

OIL WELL PUMP GEAR UNIT



The 2-Speed, Double Reduction Philadelphia Oil Well Pumping Unit. Note convenient Handwheel for speed changes—and that Motor and Gear Units are mounted on a common baseplate.

This 2-Speed, Double Reduction Unit is made to give the necessary "SLOW PUMPING SPEED," —the "HIGH CRANK SPEED" (for redrilling or completing), and the "HIGH SPROCKET SPEED" (for driving the Rod & Tubing Hoist).

It is different than any other OIL WELL PUMP UNIT, because the "change-over" in speeds is accomplished by the "mere turn" of a handwheel (located on the outside of the casing). It is unnecessary to take the time and trouble to remove the cover and change gears, as in other Units.

Philadelphia Oil Well Pumping Units are the result of NEARLY 50 YEARS GEAR MAKING EXPERIENCE. They are designed right, and built of the very best materials to assure long life and economical operation.

Main Office and Plant
Erie Ave. and G St.
Phila., Pa.

PHILADELPHIA GEAR WORKS

Manufacturers of Industrial Gears and Speed Reducing Units

Mid-Continent Distributors
Petroleum Electric Co., 217 E. Archer St., Tulsa, Oklahoma

THE OIL INSURANCE ASSOCIATION

PROVIDES FOR REAL FIRE INSURANCE FOR THE OIL INDUSTRY THROUGH ITS MEMBER COMPANIES

The Oil Insurance Association is in its ninth year of successful operation, with 100% performance record testifying to the dependability, thrift and speedy and complete satisfaction of its service.

Among the purposes for which the Oil Insurance Association was organized are:

To enable oil operators to secure sufficient dependable insurance to adequately protect their interests.

To furnish property holders and those controlling oil business expert engineering and inspection service, so methods of insuring this class may be standardized, and efficient fire protective devices installed and properly maintained, thereby stabilizing the business to the point which will enable insurance companies generally to accept the class at fair cost and under equitable policy rates.

To make available the most business-like insurance arrangement for all oil companies.

Complete details of the Oil Insurance Association may be obtained from your insurance agent or broker.

OIL INSURANCE ASSOCIATION - H. M. Carmichael, Mgr. - 209 W. Jackson Blvd., Chicago

Speculating on Seminole's Finish

Crape Hangers Active, but There Are Those Who See a Lot of Vitality in the Field. New Year's Production Prophecies

By James McIntyre

Seminole is being very much discussed these days. Not the progress of Seminole, but its finish. A good many Mid-Continent oil men want to give you an argument on why we should get ready to hang the crape on Seminole's door. They think the patient is sick and hasn't long to live. They look foward to a sudden and complete collapse as a big field.

There is a minority that see a lot of vitality in Seminole and who believe it will be making 375,000 bbls. by the first of the year and that it will settle down to a long period of good production before it is cast into the scrap heap of old and inconsequential fields.

There are good grounds for thinking that Seminole is due for a big tumble in production by the end of the year. Since July 30, 1927, when it reached its peak of 527,400 bbls. it has fallen off over 80,000 bbls. a day and it has only one more month in which to recover in part from that decline. After that it can do nothing but slump for the simple reason that the territory, in the pools already known, will have been practically drilled up. By January 1, 1928, it should be entirely drilled up.

On July 30 Seminole produced 527,400 bbls. from 638 wells. Then the production of those 638 wells began to fall off so rapidly that the new wells which averaged a shade more than three per day could not stay the decline. In the next 75 days the field showed 256 added producing wells but a drop of 84,016 bbls. in the total production. The average production of the wells on July 30 was 826.6 bbls. per well. On August 13 the average per well had fallen to 497 bbls.

Below will be found a table giving the production of the Seminole Field on July 30 and on October 13:

	Little River No. Wells		Daily Prod.
July 30	1		11,610
October 13	32		39,648
Increase	31	Increase	28,038
	Bowlegs		
	No. Wells		Daily Prod.
July 30	174		193,511
October 13	257		133,811
Increase	83	Decrease	59,700
	Earlsboro		
	No. Wells		Daily Prod.
July 30	111		204,609
October 13	219		171,558
Increase	108	Decrease	33,151
	Seminole		
	No. Wells		Daily Prod.
July 30	310		83,778
October 13	326		69,072
Increase	16	Decrease	14,706
	Searight		
	No. Wells		Daily Prod.
July 30	42		33,892
October 13	60		29,295
Increase	18	Decrease	4,597

Producing Its Limit

The whole field is producing full tilt. It could do better if all the wells that have not been shot were given a dose of nitroglycerin, but otherwise it is producing all it can, and yet it is below the 450,000-bbl. limit permitted under the rules now governing the development of the field. The newest pool in the field, Little River, which is permitted to produce 49,000 bbls. per day, could not do better than 39,648 bbls. on October 13. Only a few of the 32 wells were flowing naturally. The bulk of them were producing by air lift or on the swab.

A recent analysis of the drilling situation in Seminole showed 346 wells drilling in the five pools. Of this number 67 had reached a depth between 3,100 and 3,700 feet and 226 were below 3,700 feet. Every one of these 293 wells should be completed before the end of the year and the 226 below 3,700 feet should be in by November 15. With the completion of the 346 wells the area will be practically drilled up so far as the known pools are concerned and if the estimates of no less than six men who keep in close touch daily with the Seminole region average correctly, the field should be making no more than 330,000 bbls. a day by December 31. The half dozen prophets who took part in this average estimate varied between 300,000 and 360,000 bbls. in their estimates. This would bring the average per well down to 266 bbls. per day. All the estimates were given as maximum figures. With the end of the present campaign of drilling the decline in the five Seminole pools should be rapid for a time.

Pool Peaks and Declines

All the pools in the field with the possible exception of Little River have passed their production peak. Seminole City, the first pool, opened, so far as the Wilcox sand is concerned, in July, 1926, reached its high point of production on February 22, 1927, when it produced 264,500 bbls. Up to October 13 it had declined 74 per cent from its peak. Searight was a Hunton lime pool for several months before the Wilcox sand was uncovered in October, 1926. The pool reached its peak of 40,621 bbls. on June 15, 1927, and has declined 28 per cent since.

Bowlegs, opened late in December, 1926, reached its peak on July 14, when it made 194,773 bbls., and has declined 31 per cent in three months. Earlsboro was discovered in December, 1926, and hit the top of its production, 209,874 bbls., on August 10, 1927, and in two months has fallen 18 per cent. Little River, the newest of the Seminole Pools, was discovered in May, 1927, but did not begin producing in quantity until late in June. It reached 42,906 bbls. on September 29, but has fallen 7.6 per cent. It may make a new peak and estimates as high as 70,000 bbls. a day have been made on the future of this pool.

Following are the figures showing peak production and date, and productin as of October 13, of the various pools in the field:

	Bbls.
Seminole City Pool, Township 9-6	
February 22, 1927 (peak)	264,500
October 13, 1927	69,072
Decline	195,428
Percentage decline	74
Searight Pool, Township 10-6	
June 15, 1927 (peak)	40,621
October 13, 1927	29,295
Decline	11,326
Percentage decline	28
Bowlegs Pool, Township 8-6	
July 14, 1927 (peak)	194,773
October 13, 1927	133,811
Decline	60,962
Percentage decline	31
Earlsboro Pool, Township 9-5	
August 10, 1927 (peak)	209,874
October 13, 1927	171,558
Decline	38,316
Percentage decline	18
Little River, Townships 7-6 and 8-6	
September 29, 1927 (peak)	42,906
October 13, 1927	39,648
Decline	3,258
Percentage decline	7.6

Current News and Views

In the past week there were no outstanding new features in the Seminole Field, but considerable interesting news bearing on the territory may be put together.

The Little River Pool, in Township 7-6 and 8-6 is the most interesting of all because it is the newest and has not yet been defined. There is much speculation as to the trend of the pay sand, and while dry holes have cast a deep cloud over a goodly portion of the area which in the beginning was included in the "likely-looking" acreage, not enough wells have been completed in strategic locations to make it possible to draw a definite outline of the pool. The pool may string out in a southwesterly direction for miles, because while the discovery well was completed in the northwest corner of Section 1-7-6 the Barnsdall Oil Co. has a good-looking prospect on a "high" down in Section 22, and until some one comes along with a salt water well in the Wilcox on the line between the present known production and that Barnsdall well, the intervening territory cannot but look good. The Carter Oil Co. has a well drilling in Section 22, which will help to make the situation clearer. One perhaps siguificant feature of the past week's developments in Little River was the fact that the Continental Oil Co.'s No. 2 Cosar in SW SE NW Section 36-8-6, was running higher than the wells near it and as it is a half mile northeast of production it gave out the impression that the field would run more to the northeast than any other direction.

This article was written on October 14. There had been enough new wells in Little River in the previous seven days to have brought the production up to a new peak if Little River were another Earlsboro, but nearly all the recent completions failed to produce until they were swabbed. A number of wells that had quit producing and were put on air or gas responded very satisfactorily for a short time and then began to show a sharp decrease in production.

A Possible Pool Connection

It is not far from the north end of the Little River Pool to the south end of the Bowlegs Pool and the Indian Territory Illuminating Oil Co.'s No. 1 Hull, NW NW SE Section 26-8-6, a semiwildcat about half way between the two pools may be either a north extension of Little River or a south extension of Bowlegs. It is not a big well, having yielded no more than 350 bbls. a day and that on the swab, and it is low on the structure, but its location has given rise to the thought that the two pools may be joined by a narrow strip of pay, as Bowlegs and Seminole just missed doing.

Shooting Wells in Earlsboro

In the Earlsboro Pool, in Township 9-5, the shooting of wells did much to stay a production decline, but it was noticeable that while the shots stimulated the production it was only for a short time. The Skelly Oil Co.'s Spencer lease in Section 12, which was treated to nitroglycerin the week before, produced 15,000 bbls. The Continental Oil Co.'s Spencer lease also suffered a rapid drop from about 15,000 bbls. to 10,000 bbls. Water encroachment in the northeastern part of the pool is an alarming symptom. This water is coming in in a part of the field wh'ch is not all drilled, and where production is heaviest. The last virgin lease in the Earlsboro sector has a producing well on it. The Shaffer Oil & Refining Co.'s No. 1 Clark, in Section 1-9-5. It made a 750-bbl. well on the swab.

Pipe Line Situation

The pipe line situation in the field has changed somewhat. The Magnolia Pipe Line Co. ran almost its capacity of 55,000 bbls. a day. It averaged 53,805 bbls. during the week as against an average of 38,286 bbls. the previous week, while the Oklahoma Pipe Line Co. ran 75,037 bbls. as against 81,155 bbls. the previous week. The Prairie Pipe Line Co. ran 67,622 bbls. a day as against 75,445 bbls. the week before. These represented the most marked differences in volume of business done. The largest shipper by tank car is the Kay County Gas Co. (Marland), which transported an average of 12,209 bbls., or nearly half the total shipped in this manner.

The Magnolia has shown an eagerness to acquire oil. It has made new and important connections, hooking up to Independent and Gypsy leases in recent days. The Magnolia has completed a 5-inch line from Little River to Maud and is taking oil from the Little River Pool. It expects to buy 5,000 bbls. a day in that pool. The Oklahoma pipe line immediately connected with leases from which another company had cut runs. The impression prevails in the Seminole district that the Oklahoma Pipe Line Co. will increase its runs and that the Carter Oil Co. will be a very active buyer in the field the balance of the year.

The Shaffer Oil & Refining Co. has completed a 4-inch line from Seminole to Earlsboro, and has increased its purchases of crude.

The Continental Oil Co. has increased its tank building program in Section 2-9-6, and will have five 80,000-bbl. tanks and one 55,000-bbl. tank instead of one 80 and one 55. The company is storing more than 2,000 bbls. a day.

The daily average runs to storage in the past week were approximately as follows: Indian Territory Illuminating Oil Co., 22,000 bbls.; Independent Oil & Gas Co., 15,000 bbls.; Pure Oil Co., 12,500 bbls.; T. B. Slick, 4,000 bbls.; Barnsdall Oil Co., 4,500 bbls.; Amerada Petroleum Corp., 3,500 bbls.; Tidal Oil Co., 2,000 bbls.; Phillips Petroleum Co., 1,000 bbls.; Carter Oil Co., 2,000 bbls.; Blackwell Oil & Gas Co., 3,500 bbls. Total, 68,500 bbls.

The Texas Pipe Line Co. is hurrying work on an 8-inch line from Section 25-8-6 to Stuart Station near McAlester, Okla., and may be running oil through the line by November 1.

Oil in Storage

On October 12, 15,062,848 bbls. of crude was stored in the Seminole Field and on that day there was yet 5,885,333 bbls. of available storage room. Some of the companies are nearly brim full. The Carter, Gypsy and Independent companies have their tanks full. If the pipe line situation tightens up it may be necessary to increase the number of steel tanks. The program now is for fifteen 55,000-bbl. tanks and forty-six 80,000-bbl. tanks, a total of 4,401,000 bbls., which would make the storage capacity 25,348,000 bbls.

NEW ENTERTAINMENT

J. Elmer Thomas, president of the Fort Worth, Tex., Geological Society, has started a new form of entertainment for members of the society and any others who want to take part. A wildcat or semi-wildcat test in West Texas which has just been spudded was selected and all geologists interested in that area were asked to contribute $1 toward a pot and make their guess as to the depth at which this well would reach the top of the Big Lime. The wildcat selected for the first pot is Amerada Petroleum Corp.'s No. 1 Walton, in Winkler County, about 4 miles northeast of the present producing limits of the Hendricks Pool. So far the guesses range from plus 200 feet (or 200 feet above sea level) to minus 235 feet. Wells in the pool have found the lime as high as 600 feet above sea level and as low as 104 feet below. Nothing but theory can be used in making an estimate of the depth to the lime in the Amerada well as there are no near-by tests to go by. Several contributions and guesses have been made by persons who are not geologists and one of these placed a side bet with Mr. Thomas that somebody not a member of the Fort Worth Geological Society would win the pot.

Users universally recognize the lasting quality and economy of Sheffield Copper Steel Sheets—and prefer equipment made with them.

Specify Sheffield
Copper Steel Sheets

SHEFFIELD STEEL CORPORATION
KANSAS CITY, MO.

New Billet Reinforcing Bars . . Rail Steel Reinforcing Bars . . Blue Annealed Sheets . . Merchant Steel Bars
Merchant Iron Bars . . Bolt and Nut Products . . Sucker Rods . . Pull Rods . . Track Spikes . . Forgings . . Rivets

POINTERS on Steel Derricks

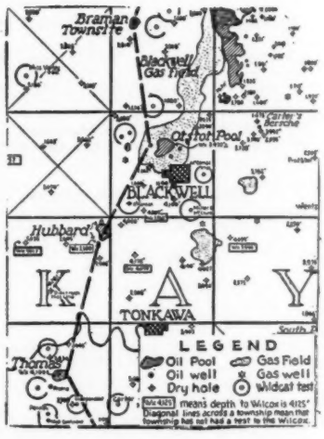
Stability

O'Brien Steel Derricks are *strong* and *rugged*. They are scientifically designed to withstand the hardest strains. With wood, it is a difficult matter to know just what load it will stand, due to the variations in different pieces of wood. With steel, however, the various stresses and strains it will stand are definitely known and it is a very simple matter to provide the required strength. The O'Brien Steel Derrick is one upon which you can depend—whose safe loads and stresses can be accurately figured. There is no uncertainty about these important factors.

Why Experiment? O'Brien Derricks will drill your wells and pull your casing.

O'BRIEN STEEL CONSTRUCTION COMPANY, INC.
Washington, Pennsylvania

Western Representative
RIG EQUIPMENT COMPANY, 1524 So. St. Louis St., Tulsa, Okla.
Stocked at Earlsboro, Okla.



A small reproduction of part of a large map which appeared in a previous issue.

All Oil and Gas Journal maps, charts, well-logs and cross sections are dependable.

They are always up to date, prepared from first hand information gathered right on the spot in the oil fields, and appear at a time when *they are most valuable.*

Territories have been explored successfully by oil companies and individuals who were guided by the information contained in the Maps, Charts, Well-logs, and Cross Sections published exclusively in The Oil and Gas Journal—"The Oil Man's Bible."

Be among the best informed oil men. Read The Oil and Gas Journal. Get it at your home or office every week and always renew your subscription promptly.

The Oil and Gas Journal
Tulsa, Okla.

35 CENTS a line first insertion; 25c a line each additional insertion. Cash in advance.

CLASSIFIED WANTS

CREATE AND BUILD BUSINESS

MAIL your advertisement now. It will be published next week. Cash with order.

FOR SALE—EQUIPMENT

FOR SALE—EQUIPMENT

5 Dean Triplex Pumps, 5 by 8.

1 No. 2, 1 No. 5, 1 No. 6, 2 No. 7, 1 No. 10, 1 No. 11, 1 No. 12 Sweetland Oil Filters.

Two 10-inch S. Roturbo Centrifugal Pumps. Six 10-inch S. Centrifugal Pumps. Steam Turbine.

Storage Tanks. Send for list.

Send us your inquiries.

We buy your surplus equipment.

CONSOLIDATED PRODUCTS CO.
15 Park Row, N. Y. C. Barclay 0603.

HOUSE MOVING Equipment—Up to date; jacks, pulleys, timber trucks, winch and cable for sale. O. E. Thomas, Kearney, Mo. Phone 178.

TANK CARS AND RELAYING RAILS

10 Class 3—8,000-gallon capacity tank cars.

300 tons 75-lb. and 200 tons 70 lb. relaying rails.

ED. ELSON,
Boatmen's Bank Bldg., St. Louis, Mo.

FOR SALE—Equipment for nine wells in ground, 7 miles west of Humbolt, Kans., 750 feet deep, casing, tubing, rods, jack, tow tanks; will pull for buyer if necessary. Drs. White & White, Suite 305, Roberts Bldg., Tulsa, Okla.

TANK AND TANK CARS

45 tanks of 6,000-gallon capacity taken from tank cars; 5 tank cars with tanks complete with couplers, air brakes, etc., cheap. Wire for prices. MAX ZEIGLER & BROTHERS, MUNCIE, IND.

FOR SALE at a bargain or will trade for acreage or interest: Six 67 ft. and one 74 ft. steel derricks, four with 3-inch legs and three with 2½-inch legs; all equipped with two beam crown block; 9-inch steel headers; 4-foot 6-inch top; derricks have not been used; stored Tulsa. E. F. Murphy, P. O. Box 1694 or telephone 2-1302, Tulsa, Okla.

FOR SALE—GASOLINE PLANT

Equipment and storage tanks.
Address CGH, The Oil and Gas Journal, Tulsa, Okla.

COMPLETE STOCK used and new pipe at attractive prices. Low prices on used Rotary Rigs or will rent with option to buy. Texas Supply Company, Lorraine & Semmes Streets, Houston, Texas.

FOR SALE—Complete boiler installation equipment consisting of 75 and 150-H.P. boilers; good condition, almost new smokestack. The Rosedale Milling Co., Kansas City, Kans. Phone Rosedale 1014.

FOR SALE

Complete Standard drilling Rig. New Marion Rig Irons, new Boiler new drilling lines, drilling tools and fishing tools, everything needed to drill deep. Located in Western Kansas. Bargain for cash. Address Box C-11, The Oil and Gas Journal, Tulsa, Okla.

USED LINE PIPE AND CASING FOR SALE

7—25-Hp. used gas engines.
10—6-in. standard rigs.

15,000 ft. 5¼-in. used casing.
15,000 ft. 6⅝-in. used casing.
10,000 ft. 8¼-in. used casing.
5,000 ft. 10-in. used casing.

75,000 ft. 3-in. used line pipe.
50,000 ft. 4-in. used line pipe.
20,000 ft. 6-in. used line pipe.
For immediate shipment from our Texas yards.

KEYSTONE PIPE & SUPPLY CO.
607 Holmes Bldg.,
Fort Worth, Tex.

TANK CAR TANKS

Desire move quickly. If interested in storage, get our prices. Carnes Equip. Co., Olathe, Kans.: Sand Springs, Ok.

FOR SALE—A-1 good as new 3,200-ft. 6-in. National upset drill pipe with Johnson tool joints on doubles. Acme Pipe & Supply Co., Corsicana, Texas.

EQUIPMENT WANTED

WANTED to purchase portable casing head gasoline plant. Give complete description and price. P. O. Box 123, Tulsa, Okla.

WANTED—Rotary drilling outfit and standard string cable tools. Must be cheap and in good shape. Address Box 684, McAlister, Okla.

WANTED to buy salvage pipe, abandoned pipe lines and casing tonnage material leases salvaged. Acme Pipe & Supply Co., Corsicana, Texas.

MANUFACTURING MACHINISTS

CRAGO CUT GEARS

Worthy of your confidence. General machine work. 1416 Walnut, Kansas City, Mo. Phone Harrison 7660.

MACHINE WORK — CASTINGS

Machined to your drawings, Gears, Machinery designed and built.
Modern Facilities—Prompt Service
Reasonable prices. Send for our booklet.
GENERAL ENGINEERING AND MFG. CO., ST. LOUIS, MO.

ADVERTISING RATES

	1 Time	2 Times	3 Times	1 Mo.
3 lines	1.05	1.80	2.55	3.30
4 lines	1.40	2.40	3.40	4.40
5 lines	1.75	3.00	4.25	5.50
6 lines	2.10	3.60	5.10	6.60
7 lines	2.45	4.20	5.95	7.70
8 lines	2.80	4.80	6.80	8.80
9 lines	3.15	5.40	7.65	9.90
10 lines	3.50	6.00	8.50	11.00

(Six words usually make a line.)
Compute white space at the above rates.

Mail your advertisement to

THE OIL AND GAS JOURNAL

Tulsa, Oklahoma

PUBLICATIONS

COLOMBIAN PETROLEUM INFORMATION

Oil business. Geological maps. Reliable oil information. The most up-to-date Columbia Oil Map, size 54"x91", prepared by Jesus Jimenez J. formerly at Columbia Bureau of Mines. Shows oil companies' properties, pipe lines, anticlines, wells. Address all communications to J. J. Jaramillo, 66 Bever St., New York, N. Y.

NO CHARGE

One month's subscription to Pecos County's pioneer newspaper. Reliable information from county seat. Free.

A. L. HILLER
Fort Stockton, Tex.

MONEY RAISING

RAISE CAPITAL!

Through sale of securities in your corporation. Worthy enterprises only. Twenty-five years experience. Highest references.

NORTHCLIFFE,
25 West Forty-third, New York.

DO YOU NEED MONEY for organizing or financing oil or mining deals? Write 131 E. 13th, Oklahoma City, Okla.

PATENT ATTORNEYS

REGISTERED PATENT ATTORNEYS
United States and Canada
Before disclosing your invention to anyone, send for blank form.
Evidence of Conception
Bulletin "How to Establish Your Rights" and complete information free.
LANCASTER & ALLWINE
240 Ouray Bldg., Washington, D. C.

OIL INDUSTRY PRINTING

OIL FIELD LEGAL BLANKS

Leases, assignments, releases, township books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

CONSUMERS' LEDGERS

We are prepared to furnish from stock standard forms of gas meter Consumers' Ledgers. Sample forms and quotations on request. First-class material and workmanship.
DERRICK PUBLISHING CO.
Oil City, Pa.

BUSINESS OPPORTUNITY

MORE AND BETTER gasoline by new patented cracking still. Six claims. Independent refiners must utilize it or quit. Will sell patents and help finance company for Mfg. and installations. O. Vinie, 3147 Logan Blvd., Chicago, Ill.

FOR SALE—Boiler and tank repair shop located in center of oil and gas field, in town of 8,000; this will bear investigation. For further information write, Westerman Bros., Bremen, Ohio.

WHEAT—CORN. $10 no more, buys option 5,000 bu. wheat, corn. Possibility large profits. Particulars free. Write today. GRAIN TRADERS SERVICE, Dept. OG, 22 Quincy, Chicago, Ill.

WANTED for immediate drilling, block of semiproven oil and gas leases. Not over 3,000 foot territory, Kansas preferred. Principals only. Address Box 725, Winfield, Kans.

WILL PAY CASH

For gas situations having income $100,000 or more.
P. J. MINCK,
720 So. Kenosha Avenue, Tulsa, Okla.

WANTED PROMOTER

Have a large copper deposit carrying gold and silver values. If you can raise money to develop same will turn the control over to you. Address Miner, 56 East Hoover St., Phoenix, Ariz.

$25,000 BUYS one of the best Mica properties in South. Alfred Day, New Tyler Hotel, Ft. Worth, Texas.

FOR COPY of "The Promoter's Hand Book," a leaflet on financing, send $1 to Amster Leonard, East Orange, N. J.

RAISE MONEY to enlarge your business. Do you need capital for oil, mining, manufacturing, real estate or mercantile development. Ask for free folder. Tells how to raise capital. Small cost. Write today. Faultless Service, Quincy Bldg., Desk J, Chicago, Ill.

OWNERS SEND US full information as to your leases, royalties, drilling blocks and producing properties.
W. T. and C. C. Doyle,
806 Southwestern Life Bldg.,
Dallas, Texas.

MR. WILDCATTER

Do you need money to finish or go below contract depth? We may be able to assist you, write stating location and depth of well, kind of rig, amount of acreage, condition of hole, contract depth and all other information possible. Send geological map and report if you have one. Box C-33, The Oil and Gas Journal, Tulsa, Okla.

FINANCE your project with stock bonded. Quickest and most satisfactory known method of raising capital. Information free. Bankers Interstate Security, Electric Bldg., Denver, Colo.

INCORPORATIONS

CHARTERS—Delaware best, quickest, cheapest, most liberal. Free forms. Colonial Charter Co., Wilmington, Del.

DELAWARE incorporators. Charters fees small, forms. Charles G. Guyer, 901 Market St., Wilmington, Del.

HELP WANTED

WANTED—A first class production man to manage rotary and cable tool drilling and production in Oklahoma and North Texas. Reply giving experience and references. Box C-72, The Oil and Gas Journal, Tulsa, Okla.

FOREIGN WORK. Men interested in oil, mine, railway work, etc., in South America, write at once. South American Service Bureau, 14,600 Alma, Detroit, Mich.

WANTED—Services of competent Patent Lawyer. Must absolutely be thoroughly familiar with oil well tools and equipment. Box C-73, The Oil and Gas Journal, Tulsa, Okla.

$3,000 TO $25,000 men find our Service effective in making connections. Individual. Confidential. Not agency. Jacob Penn, Inc., 9 Park Place, New York.

TERRITORY REPRESENTATIVE

Must have a good sales record preferably in the mechanical equipment or Boiler Room supply line. Acquaintance with buyers in industrial trade desirable. Only a responsible, ambitious man with real sales ability will be considered. To the man selected we offer an exclusive sales territory and thoro training. This is a permanent position selling products nationally used and backed by a bond. Replies confidential.
THE NORTH AMERICAN FIBRE PRODUCTS CO.
Cleveland, Ohio.

ADDRESSES WANTED

IF HERBERT F. MILLER who was associated in 1913 with JOHN W. FLANAGAN in leasing certain lands in the district of Tuxpam, Vera Cruz, Mexico, will communicate with the address given herein, he will learn something to his advantage. Information relative FLANAGAN will also be appreciated. Box C-70, The Oil and Gas Journal, 101 Park Ave., New York, N. Y.

POSITION WANTED

A NO. 1 SALESMAN, wishes position. Long experience in refined oil products; also, knowledge of oil wells supplies. Best references. Box C-77, The Oil and Gas Journal, Tulsa, Okla.

STENOGRAPHER - SECRTEARY. Young man with thorough business training desires position with oil company or operator. Familiar with oil business. Wish opening with a future. Best references. Age 20. Box C-76, The Oil and Gas Journal, Tulsa, Okla.

SUPERINTENDENT—College graduate. Familiar with construction and operation of complete plants with all types of modern equipment on paraffin and naphthine base crudes. Can organize efficient operating organization and install modern system of refinery accounting. Will go anywhere. Address Box C-75, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE—DOGS

COONHOUNDS, combination hunters, fox hounds, champion rabbit hounds. Catalogue, photos free, trial. L. J. Adams, Ramsey, Ill.

REAL ESTATE

FOR SALE—Colorado modern home, 9 rooms, gray stone house, mountain water, excellent location. Bargain for cash. P. O. Box 87, Florence, Colo.

A VERY BEAUTIFUL HOME

We are offering one of the most beautiful homes in Oklahoma City, furnished or unfurnished, at a great sacrifice. The place is up to the minute and was only recently built. Reason for selling, death in the family. Do not overlook this if you are coming to Oklahoma City. J. P. Cook Co., 422 Elks Bldg., M. 0477, Oklahoma City, Okla.

35 CENTS a line first insertion; 25c a line each additional insertion. Cash in advance.

CLASSIFIED WANTS

CREATE AND BUILD BUSINESS

MAIL your advertisement now. It will be published next week. Cash with order.

LEASES—PRODUCTION

HAVE GOOD Custer, Washita and Caddo County oil leases for sale from $1.50 to $6. Right on the structures where the companies want them, also drilling blocks. Write me where you want your leases and I will make you a good price. J. J. Sallaska, Corn, Okla.

WEST TEXAS—Fee, 40 A. to 30,000. Lease, 40 A. to 115,000 A. Royalties, 40 A. to 40,000. Keep your eye on West Texas but better still place some money NOW. J. S. Jones, First National Bank Bldg., Ft. Stockton, Texas.

CHEAP LEASE IN HOWARD
Land in fee. $2.25 an acre, bonus, all mineral rights. Joe Cunningham, Big Springs, Texas.

BY OWNER—Must raise cash at once. 80 acres located 14 miles North Tulsa, good land, improved, some production, good chance for more, priced to sell. $6,000 if taken at once. Boxe C-74, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE in Crockett County, Texas, where big wells are coming in, one 10 acre lease, $250. One 20 acre lease, $200. Write for description. M. T. Heath, 147 West 71st, Chicago, Ill.

FIVE ACRES oil lease for drilling. Section 59, block 101, in Pecos County, Texas. Want it drilled on the 50-50 basis. P. O. Box 2592, Los Angeles, Calif.

FIVE THOUSAND ACRES, solid block, Crockett County, Texas; will make drilling proposition. Good geology. Box C-71, The Oil and Gas Journal, Tulsa, Okla.

ADVERTISING RATES

	1 Time	2 Times	3 Times	1 Mo.
3 lines	1.05	1.80	2.55	3.30
4 lines	1.40	2.40	3.40	4.40
5 lines	1.75	3.00	4.25	5.50
6 lines	2.10	3.60	5.10	6.60
7 lines	2.45	4.20	5.95	7.70
8 lines	2.80	4.80	6.80	8.80
9 lines	3.15	5.40	7.65	9.90
10 lines	3.50	6.00	8.50	11.00

(Six words usually make a line.)
Compute white space at the above rates.

Mail your advertisement to

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

FOR SALE—At bargain price oil and gas lease on 320 acres; 80 acres in Allen County, Kans., E½ SE¼ Sec. 27 T24 R21; 240 acres in Bourbon County, Kans.. NW¼ & N½ of NE¼ Sec. 26 T24 R21 leases adjoins, with 18 producing shallow wells and about 20 locations to be developed. Write W. H. Quigley, 1506 Linwood Blvd., Kansas City, Mo.

FOR SALE—Small production on 560-acre lease in Weston County, Wyoming. Seven wells completed and one now drilling. Gas to operate lease. Small gasoline plant on the property. H. S. Glenn, Oakmont, Pa.

BREWSTER COUNTY
Oil Leases and Royalties, specialty. Bought and sold. Bargain Prices—Real Estate Listings solicited—Wire or write. Box 51, Alpine, Tex.

.. WILDCAT TERRITORY ..

Oil and gas showing in water wells, substantiated by committee report. 6,000 acres commercial leases. Will checkerboard for test well. Central Illinois. S. J. Burkitt, Mowequa, Ill.

LEASES—PRODUCTION

SOUTHWEST TEXAS — WINKLER, Loving, Reeves, Ward, Pecos, Culbertson Counties.
Drilling blocks, Leases, Royalties. Ranches in fee.
H. F. Anthony, Pecos, Tex.

FOR SALE—2,370 acres in Richland Parish, La., the home of the great gas field; worth more than asked; for gas, oil or farming purposes; price $10 acre. W. T. Pitts, The Land Man, Indianola, Miss.

CLASSIFIED advertisements in this section do pay well in money and in extended business relations. This has been proven by the continual advertising that we receive from the men in the oil industry, everywhere.

LEASES, royalties and drilling blocks bought or sold, West Texas. Wire or write Cope and Fox. 411 San Angelo Nat'l Bank Bldg., San Angelo, Texas.

FOR SALE—New 10-year oil leases and half perpetual, participating royalties on lands in Harper, Woodward, Ellis, Major and other counties in western Oklahoma. A. B. Hugo, Enid, Okla.

BREWSTER COUNTY, TEXAS

16,095 acres FEE-patented, unleased, unencumbered, 100% of all MINERALS. Perfect title. Block B-8, G.C.&S.F. Fronts Rio Grande River. Price $2.75 per acre. Terms to responsible parties. Nothing reserved to the State. THE BEST BUY IN WEST TEXAS.

J. S. JONES,
First National Bank Bldg.,
Fort Stockton, Texas.

OIL AND GAS leases in Live Oak County. Bargains in Real Estate. C. B. Beard, George West, Texas.

FOR SALE—Several 40 and 80-acre leases in Curry and Roosevelt Counties at $1 per acre, term 10 years, annual rental 50c per acre. E. E. Jack, Clovis, N. Mex.

FOR SALE—10-year leases Oklahoma, 160 acres Section 22-18N-1W, Payne County, 50 acres Sections 13 and 24-4N-1W, Garvin County; 120 acres, Section 17-9N-R-6W; 2 40-acre strips, Section 14-7N-R5W, Grady County. C. L. Norton, 606 Rockefeller Bldg., Cleveland, Ohio.

HAVE BLOCK of leases in good gas territory; need help in financing test well. Shallow drilling. Oakland Drilling Co., 614 Barnes Bldg., Muskogee Okla.

I OWN a commercial lease on 315 acres in Muskogee, County, Okla., with production on three sides, within a quarter of a mile. Will give a good percentage drilling contract to responsible parties. Write or wire. Samuel J. Clark, 1011 Montana St., El Paso, Texas.

DRILLING BLOCK secured on approved acreage and well supervised; no bonus; we keep some acreage as fee. Nicolle, Petroleum Geologists and Operators, Box 1720, Fort Worth, Tex.

"IN THE TREND"
Southeastern New Mexico and West Texas counties — Lea, Eddy, Chaves, Gaines, Andrews, Winkler, Loving, Ward, Culberson and Pecos Counties, oil and gas leases, royalties and drilling blocks. We buy and sell. F. S. Blackmar, P. O. Box 541, Roswell, N. Mex.

FOR SALE—Leases, Oil Production, Asphalt, Lime Stone and Other Mineral Lands. W. P. Harley, Bowling Green, Ky.

LEASES—PRODUCTION

WOULD YOU SPECULATE IF YOUR INVESTMENT WERE GUARANTEED AND SECURED BY INTEREST BEARING FIRST MORTGAGE GOLD BONDS OF UNQUESTIONED WORTH?

We are offering leases in Union County, New Mexico, on one of the greatest oil and gas structures in America.

Listen to what the Geologists say. Prof. J. A. Pynch ,head Geologists of Fairmount College, Wichita, Kans., says in part: "The Structures in Union (Co. N. M.) are the best I have ever seen in any of the many fields I have examined in Oklahoma, Texas, Kansas and other states. I believe the structures are favorable for oil in large quantities, as it has a wide field to draw from."

Dr. N. H. Darton, noted geologist of the U. S. Geological Survey, after examination 9 or 10 years ago, said in part: "The North-Eastern part of New Mexico and the North-western part, probably offers greater encouragement for the discovery of Commercial oil fields than other parts of the state. Oil, gas and asphalt are present in these areas."

C. W. Buskirk, a successful geologist of Texas, after three investigations in Union Co., reported (in part): "In our opinion the structures are the largest and finest known in any probable productive oil field and will, we think, develop into one of the greatest gas fields in the world, with oil down the slopes a greater distance than is found in most structures. We had the pleasure of checking up the Amarillo field prior to its development and in our judgment the Union Co., structures are much finer and better defined."

Mr. Gould, head geologist of the Okla. University, writes a very favorable report, as does many geologists of the big companies who have acreage in and around the leases we are offering, many of whom are obligated to drill. THE GREAT PLAY IS COMING.

We offer these leases at $5 per acre and furnish an interest bearing FIRST MORTGTGE GOLD BOND to the amount of each purchase, vouched for by Dun and Bradstreet. Do not confuse this acreage with the off-structure acreage selected haphazard and offered on the market.

We will sell from 40 acres up. Write for full details, maps, etc.

Reference, Security National Bank, Wichita Falls, Texas.

MATHEW RAMAGE, Agt.,
1002 8th Street,
Wichita Falls, Texas.

IF YOU buy or sell royalties, leases or production you should not overlook The Oil and Gas Journal Classified Wants. They comprise the best medium of exchange available to you.

WINKLER—PECOS COUNTIES
Leases and Royalties
W. S. PATTERSON
Pecos, Texas

OIL LEASES and royalties, Ector, Crane, Pecos, Reeves, Ward, Upton and Winkler Counties; buy or sell. C. H. C. Anderson, 712 Linz Bldg., Dallas, Tex.

NEW MEXICO oil leases: Lea, Eddy, Chaves, Union, Quay and all other active counties; complete list and map on request. Orcutt-Harris & Co., Colcord Bldg., Oklahoma City, Okla.

ROYALTIES—PRODUCTION

WEST TEXAS ROYALTIES
FOR SALE
Of prime consideration is our geological work accompanying each offer.
J. F. MARION OIL COMPANY
1213 Magnolia Bldg., Dallas, Texas.

ROYALTIES—PRODUCTION

DEED ROYALTIES — Get in on ground floor in Lea County, N. Mex. Ten acres up to a section or more. Wire or write BLUE QUAIL ROYALTY ASSOCIATION, Box 383, Odessa, Texas.

WILL SELL—Mid-Continent royalty interests in eighty properties in five States with $8,000 income and valued at $300,000, and in addition 600 acres Upton, Texas, with income $3,000, and 100 acres Seminole-Empire-Magnolia big production, division soon, all offering large possibilities from further developments. Will sell all for $140,000 and on another bunch of production with very large income might deliver for $110,000 additional. R. M. MacCormac, 1320 Commerce Bldg., Kansas City, Mo.

FOR SALE—All or part 1/16th interest in 700 acres, all proven oil leases and 7 wells. E. Trenton Rock Field. Priced to net large return. Box C-60, The Oil and Gas Journal, Tulsa, Okla.

WANT EASTERN ROYALTY connections. Joe P. Crawford, Petroleum Bldg., Oklahoma City, Okla.

NOTICE
Offering undeveloped and producing royalties, leases and drilling blocks, Brown (Fry Field area), Coleman, Callahan and Shackelford Counties, Texas.
All offerings submitted will be accompanied by geological information.
M. ELDER & COMPANY
Coleman Hotel Bldg., Coleman, Tex.

INVESTMENTS IN WELL selected royalty interests will yield a satisfactory profit. For full information address Box 395, Muskogee, Okla.

ROYALTIES—40 acres. "In the Trend". Winkler County Texas. Harry Haynes, Grantville, Kansas.

RANCHES AND FARM LANDS

FARMS, suburban, tracts, sale or trade; bottling establishment, doing good business; sell on account of health; restaurant, rooming houses. Phone 938. 729 Mass St., Room 15, Lawrence, Kans.

FOR SALE—In Bowie County, 342½ acres, well improved, 125 acres in meadow, 35 acres in cultivation, 40 acres in pasture, 140 timber; good stock farm. Write for particulars. J. N. Wellborn, New Boston, Texas.

GREAT OPPORTUNITY — 30,000 acres Winter Garden district of Texas, 60% tillable, 1,500 acres can be irrigated, river front, substantial ranch improvements. Price $6.50 per acre. Better act. Chas. Stallings, Clyde, Texas.

RANCH FOR SALE BY OWNER
Eight hundred eighty five acres, pavement frontage, fourteen bbls. production. Fifty dollars acre. Write for description. A. G. Alexander, Ochelata, Okla.

SELLING OUT Colorado ranches, $2.50 to $5 per acre. 80 to 10,000 acres. J. Brown, Florence, Colo.

OKLAHOMA RANCHES
8 sections Cimarron County $8. 500 acres McCurtain County, fine club proposition. 2 miles Glover River. 160 acres farm land and unlimited outside range, hogs and cattle. C. A. Tilghman, 11 West Grand Ave., Oklahoma City, Okla.

FOLLOW
MID-KANSAS OIL & GAS CO.
into
Brewster County
40 to 400,000 acres
Turney ranch and other lands.
Write for geological maps.
R. E. PLUMBE
646 First Nat. Bank Bldg.,
El Paso, Texas.

240 ACRES—Well improved farm for sale; Grady County. Write Box 147, Chickasha, Okla.

TEXAS-NEW MEXICO
Ranches and business property. If I don't have what you want I will find it for you. Chas. Stallings, Clyde, Tex.

Light Demand in Chicago Markets

Little Change in Prices. Spot Gasoline Business Only Fair. Kerosene Just Seasonable. Distillate Inquiry Better

By J. B. Waldo

CHICAGO, Oct. 17.—This week opened with a light demand for all products and little change in prices. The spot business on gasoline was only fair with U. S. Motor grade quoted at 6 to 6¼ cents but more freely offered at the lower price than late last week. The larger refiners were still quoting 6¼ with some holding that price steadily while others would meet proven competition from reliable refiners. The higher gravities were in better demand and prices on these were firm.

The demand for kerosene was just seasonable but refiners are pretty well sold up and some advanced their prices to 4⅝ cents with others asking 4¾ cents.

Distillate Situation

Distillates were in somewhat better inquiry, although the spot business was not active. One refiner offered a new contract over the year deliveries the first month at 3 cents. For the next five months at 3⅝ cents and for the final six months at the market. These prices were f.o.b. Wichita Falls, Tex. Gas oil was firmly held in the zero oils while the industrial grade was freely offered and could be bought at 2½ to 2⅝ cents. The demand for zero oils is active, although the orders are not large. Refiners in some instances report that the railroads have not taken the expected quantity of fuel oil and they are seeking buyers for below 20 gravity. Some of the large industrial users of these grades report they are able to purchase at less than the prevailing market. Orders placed Monday were for small quantities and indicated no real increase in the demand. The low cold test oils in the higher gravities are firmly held and not freely offered.

Bad Road Conditions

Salesmen and other representatives of the industry in the market on Monday report road conditions in the northern part of this territory as very bad. Little motor traffic is possible off the hard roads and consumption of gasoline with the dealers in the country districts is much reduced. Dealers in the Northwest are stated to have larger gasoline stocks than is generally believed due to slow sales which have resulted in accumulations even with light purchases. The situation is generally a waiting one with nothing in the way of a change indicated for the week unless some decisive move is made to take the market out of the rut in which it now is.

Rains Hurt Business

There was little opportunity for improvement in the gasoline market during all of last week. We had little pleasant weather and the sun shone for only parts of even the best days. One of the large refinery offices received reports from its men covering practically the entire territory. After going over these reports one morning, the manager asked: "Is there any spot in the territory where it is not raining?"

Roads are in bad shape and the farm lands cannot be gone upon by teams so that all farm work in the fields is suspended, probably until there is a hard freeze.

These conditions mean that there will be no more pleasure driving in this part of the country this season and the consumption of gasoline is even now showing the result. We have had no really pleasant fals for some years so that the comparisons made with last year are with a period when the conditions were just about the same as this season. Many of the distributors state that their gasoline business is just about on a par with last year. Some say that it is a little better, others not quite as good. On the whole the consumption is not any larger than would be caused by the increased number of motor cars in use over the territory.

Borrow When Caught

The gasoline demand was hesitating and slow all the week, very little different from the preceding week as to the requirements of the dealers. They are still trying to see on how little stock of gasoline they can operate. If they get caught, they order a car to be shipped immediately or diverted if possible and borrow a tank load or two from some neighboring station until the car arrives. The Standard stations are said to be most obliging in many instances.

This method of doing business enables the distributor to operate on a minimum of supplies and permits the refiner to retain his stock of gasoline for a longer period than he would do if the dealers were buying as usual. It would be interesting to know how much less stock jobbers are carrying for the same number of outlets than they did say three years ago, when they were not quite as enthusiastic about not buying.

There is even some complaint about contracts not being taken out as promptly as they were. This is not general at all, but it shows how much reduced from last August is the jobbers' gallonage as a whole, for there are fer jobbers who contract for their full estimated requirements.

Contract Season at Hand

The season of renewing contracts is at hand and the business of getting the name of reliable jobbers on the dotted line is active right now and has been with most of the refining organizations for some weeks. There are a good many distributors who have contracts which provide for the sale of the entire line of products to the exclusion of any other line and which are for periods of years or for an indefinite time, and these are out of the picture when it comes to making contracts, except where there is dissatisfaction on either side which cannot be adjusted, in which case there is usually a shift in the account. Some of these dealers are worked on by the sales force for several season before they are made full distributors.

There are certain advantages in such a contract or not so many would be made. On the other hand, many dealers feel that they surrender their independence in tying themselves to one concern in this way and in fact imperil their existence as independent jobbers. This class of agreements vary with different concerns when made by the same refiner, as one dealer will want some assistance or concess on that is of no advantage to another dealer who desires something else in this agreement.

It has been stated by some of the trade, both refiners and dealers, that the making of such a contract was sometimes the occasion for cash payment of importance to the dealer. In other words, when some refiner wants representation in a certain locality and finds that he cannot secure the dealer's signature on the basis of the terms of the contract he will pay a sum to be expended by the dealer as he may see fit in expanding his business. So far as the regular contracts are now being made, there is little difference between those of this year and those made a year ago.

Spot Demand Moderate

The demand last week in the spot market was very moderate. Dealers, as has been stated, are operating with small stocks and buying for immediate needs only. This is in part due to their feeling that prices will not advance and may decline, with or without a change in the tank wagon scale. They are also in some cases encumbered with "frozen assets." They have carried accounts for their customers to the limit and this is making it hard for some to buy as freely as they might otherwise.

The position of a dealer in a farming community is not easy when the farmers are not doing as well as they would like to do. They own a lot of land and feel that they are good for all that they need, but this is not bankable security when it comes time for the dealer to pay a bill for gasoline. The keenness of the competition has a tendency to make dealers too lenient at times in extending credits.

The demand for the U. S. Motor grade was not active either for immediate or for deferred deliveries. There was a fairly steady movement on contracts and the quantity shipped was fair for the time of the year, the big business being over and only a regular seasonable consumption being the rule.

The price situation was very largely unchanged. Refiners generally are asking 6¼ cents and some gasoline is being moved by them in competition with smaller refiners and possibly some brokers at 6⅛ cents. The greatest cause for weakness in the entire category was the continued offering by Tulsa brokers of gasoline stated to be full U. S. Motor specifications, corrosion and doctor tests at prices below the market. These offers are made to marketers and to large jobbers and it is doubtless from these offers that the reports arise made by large jobbers that they can buy at the low prices which they have named in several instances.

These offers to sell carry a buying charge that amounts to an eighth of a cent a gallon, so that the price is higher than it often seems to be at first though. Furthermore, these offerings are usually in small amounts, 5, 10 or 25 cars, so that they would not go far to supply the demand. They are presumably the offerings of some small refiner without an adequate sales organization.

Not Quoting Freely

Refiners are not quoting freely for periods and if they quote at all it is on the basis of the present spot market. Some of the smaller refiners have accepted orders at 5⅞ cents last week. That seemed to be the bottom for the U. S. Motor grade. The demand for the higher gravities is better than for the U. S. Motor grade. One of the large distributors was in the market last week for 150,000 gallons of the 60-62 400 gravity and the order was placed at 6⅜ cents, which is below the market held by leading refiners. On this grade the low price was 6½ cents. There was also a considerable demand for the 64-66 375 endpoint and the range was 7 to 7¼ cents. Natural gasoline was fairly active and rather firmly held by refiners' sales representatives in this market.

Kerosene continued strong with slightly higher prices prevailing all of the week. Some buying by exporters developed early in the week. Some of the export orders had not been completed and additional cars were bought here, as high as 4½ cents being paid. According to the local concerns in the business, they are through for the present. The domestic demand is merely routine. It shows a little larger with some distributing organizations than last year, but not materially so. Refiners are pretty well sold up for immediate business but several have stated that they expected to be caught up in another week.

Waiting for Demand

Distillates are held more firmly and the asking prices are advanced a little, but the spot demand has not been large. Most of the distributors are supplied for the present and are waiting for the demand from consumers to make a larger inroad on their stocks before adding to them. The weather all of last week was chilly enough to make small fires desirable but the consumption was not large. Fires night and morning were the rule, possibly a little in the middle of the day if the sun did not shine.

The market for the zero gas oils was much more firmly held last week. The sources of supply are restricted for a real 32 36 straw zero gas oil. Very little of this product is being refined in Oklahoma and the best source of supply is from the northern Louisiana refiners. They were fortunate to have a good demand for their gas oil all summer from the south and have only moderate supplies and are holding these for 4¼ cents as their low price. Many of the newer designs of oil burners are intended to use a 28 30 gas oil, but this must have the low cold test and flash and where refined it is held for almost as high a price as the 32-36 gravity.

The dark zero oil is also firm, but the price is lower, being around 2¾ cents. There has been some buying of these zero gas oils and the market as developing indicates a rather indifferent supply. More may be available later and if it advances too much distillate swill be subsubstituted as it is in some instances today.

Industrial users prefer the gas oil to the distillate, claiming that it has greater heat values. Some of the distillates as run are really in the gas oil classifications as to gravity. There will be some blending undoubtedly of various oils as refined to secure the wanted quality at the salable price. Heavy gas oils of the U. G. I. specifications are selling fairly well, but the deliveries on contracts are much larger than the spot sales. Some refiners report that they are sold up. Others have fair quantities for sale. The end of the large demand for gasoline may release some of the straightrun product held for cracking, but the closing down of cracking stills which is being done will reduce the quantity of the cracked gas oil that is being turned out so that the gas oil market is looked upon as showing possibilities of further strengthening of prices. Outside of the business with the gas companies the demand from industrial sources for all purposes is just fair with buyers holding back their orders until the last minute.

Fuel Oil in Demand

Fuel oil is in a little better demand from some users while other large users have dropped temporarily at least out of the market owing to a general closing down on certain large plants. The steel industry is doing a little large business although there is a good deal of complaint regarding the volume of business booked ahead so far this fall. There is a better demand from the user of fuel oil for heating and distribution to the large business blocks and the apartment houses and hotels is increasing with colder weather. Several of the large local brick-making concerns have decided to close down entirely, some for four and others for six weeks, stating that there was no use in operating and piling up bricks that might not be required until next spring.

Several of the large hot house concerns are changing to coal or plan to do so as the reduced price of coal from the Indiana mines is, they claim, less than the cost of an equivalent in oil. Some of the large manufacturing plants have contracted recently with local refiners for their supply of fuel up to the first of the year. The Sinclair Refining Co., which is currently reported to have secured a number of large contracts, some of them being renewals, is now practically sold

(Continued on Page 169)

Eastern Refined Oil Market Is Weak

Kerosene, Lubs, Wax and Petrolatum Only Products Showing Strength. First Shipments of West Texas Crude Received

By N. O. Fanning
New York Bureau, The Oil and Gas Journal, Room 629, No. 101 Park Avenue, New York, N. Y.

NEW YORK, Oct. 17.—The refined oil market on the Atlantic Seaboard displayed irregularity during the past week. It is evident that conditions are very unsettled and that refiners and jobbers are in the dark as to the future. Many of them are frankly pessimistic.

About the only indications of strength during the week appeared in certain grades of kerosene, lubricating oil, wax and petrolatum. All other departments were weak.

The first indication of the coming of West Texas as a factor in the Atlantic Seaboard market was the arrival of the oil tanker Agwistone which loaded part of its cargo of over 100,000 bbls. of crude oil at Corpus Christi, to which port Humble Oil & Refining Co.'s new pipe line from Pecos County leads. This is the first West Texas crude shipped direct from that port to the Atlantic Seaboard. This shipment in itself is not so serious, but it certaintly is significant of the arrival of a new and somewhat unsettling factor into the Atlantic Coast market situation.

Leading oil marketers here are not optimistic at present with regard to the outlook, especially as regards prices. Increased sales are reported, and this is certainly encouraging. But for those who are hoping for a marked improvement in quotations, disappointments may be the rule, according to many well-informed students of the situation.

"The petroleum industry has not yet learned to take the overproduction seriously," said one factor. "While there is a scattering disposition to curtail, the fact that production is still exceeding consumption is proof enough that things may get worse before they are better, in view of the great amount of publicity that has been accorded the need for curtailment for over six months.

"Overproduction is not confined to the producer, who says that his actions are in part forced by competition and physical conditions in the field. Refiners are also operating at an excessive rate, despite warnings. The result is that much distress gasoline and other products are coming on the market at a time when consumption is experiencing its seasonal decline.

"Today we are seeing the spectacle of senseless overproduction. Tomorrow, however, we shall see the unfortunate effect of it in the form of financial loss entailed by selling at a loss, unless an immediate curb is placed on production."

Gasoline Unchanged

There has been little change in the gasoline situation on the Atlantic Seaboard during the past week. Tank car lots of U. S. Motor, natural gasoline and 54 gravity gasoline are coming in from the Mid-Continent on a fairly large scale, and offering prices of this material are said to be slightly under the prices quoted by Atlantic Coast refiners. If this continues, it is possible further reductions may be made by the latter, who are generally meeting all competition.

The Atlantic Seaboard is a large territory, and no single policy covers all parts of it, either as to selling practices or price. The disposition of the leading marketers is to fit prices in accordance with local conditions. The result is marked irregularity in prices and a departure in many instances from the tank wagon schedules published at the headquarters of the companies involved. It is naturally impossible for companies to keep track of day-to-day conditions in various parts of their marketing territory where so many changes are taking place. The best they can do is to strike an average.

The Atlantic Seaboard is still having to absorb a large amount of gasoline from California. There has been absolutely no letup in the movement and there are no indications of a letup in the near future.

The demand for gasoline has fallen off seasonably in the last week. Although the winter demand for motor fuel does not fall off as sharply as in former years, there is a noticeable decline. Open cars are rare on the roads in this territory now, whereas in the summer they seemed to be all in operation.

Late reports that Atlantic Seaboard refiners were offering U. S. Motor gasoline in tank car lots at 7¾ cents a gallon have been checked up by a large marketer, who informs The Oil and Gas Journal that so far as he can learn no business of importance has been done under 8¼ cents.

Kerosene Firm

Local refiners seem to be easily maintaining the new and higher level of kerosene prices. Water white cannot now be had under 7½ cents a gallon. The present strength is partly seasonal. Both domestic and export consumption has been heavy, and refiners here look for further improvement. With the coming of the slack gasoline season, however, many refiners have operated their plants on the basis of increased kerosene output, and this has no doubt temporarily halted the upward move in prices.

There has been a growing demand for prime white kerosene at Atlantic Seaboard points, but this is attributed largely to the advance in water white, which has impelled some buyers to save by buying the lower grade.

Furnace Oil

Furnace oil continues firm, without any change in price. Demand is increasing notably. During the last few days the heating season had its commencement, as in all apartments heat is required by law beginning October 15, but in most of them is turned on a week or so before. It is noteworthy, however, that most users have laid in a stock of furnace oil which will last from three months to the entire season, and new business from now on will be largely with new customers. Incidentally, the rate of new installations is reported to be unusually high.

Gas Oil

Marketers of gas oil report a quiet market. Prices are unchanged, with 28 plus quoted at 5½ cents, in tank car lots, at refinery.

Fuel Oil

The outstanding development in the eastern fuel oil market was the opening of bids for supplying bunker fuel oil to the United State Shipping Board at Atlantic and Gulf ports for the coming year. Bids for the Atlantic Seaboard business ranged from a minimum of $1.50 to maximum of $1.70 a barrel, as against a present bunker oil price ranging from $1.50 to $1.55. All prices are without lighterage, which ranges from 5 to 10 cents a barrel.

Results of the bidding were awaited with interest as indicating the future trend of prices. The total quantity required for Atlantic Seaboard consumption alone by the board was 8,700,000 bbls. The bids at Atlantic ports were as follows:

At New York the bidding was on 3,600,000 bbls.: Tide Water Oil Co.'s price was $1.70 a barrel plus 6½ cents lighterage; Standard Oil Co. of New Jersey's top price was $1.65 a barrel plus 6½ cents, while Gulf Refining Co. bid $1.63 a barrel plus 5½ cents a barrel for barging.

At Boston on 2,400,000 bbls.: Cities Service Co. bid $1.60 a barrel flat or a top price of $1.75 a barrel For barges the price was 6½ cents more. The Beacon Oil Co. bid a top price of $1.68 a barrel.

At Philadelphia the bidding was on 720,000 bbls.: Crew Levick Co. bid a flat price of $1.54 a barrel or a top of $1.60 a barrel, plus 5 cents for barging; Atlantic Refining Co. bid a minimum of $1.50 a barrel and a maximum of $1.80 plus 6½ cents for lighterage; Gulf Refining Co. bid a top price of $1.53 plus 5½ cents for barges, the market price at Philadelphia to be 10 cents a barrel below New York.

At Baltimore bidding was on 600,000 bbls.: Standard Oil Co. of New Jersey made the only bid, of $1.65 a barrel top.

At Norfolk bids called for 600,000 bbls. Standard of New Jersey was the sole bidder at $1.65 top.

At Charleston, S. C., the board called for 300,000 bbls. of bunker oil, on which The Texas Company bid a flat price of $1.50 and top price of $1.55 a barrel; Standard of New Jersey bid a top price of $1.60 a barrel, while the Gulf Refining Co.'s top price was $1.63 a barrel.

At Savannah the only bid submitted on the 300,000 bbls. of oil called for was by the Gulf Refining Co., which quoted a top price of $1.63 a barrel.

At Jacksonville, the Gulf Refining Co.'s bid was $1.65 a barrel top on 180,000 bbls., while The Texas Company bid a flat price of $1.50 a barrel and a top price of $1.55 a barrel.

The market for Diesel oil on the Atlantic Coast is steady. Prices are unchanged, the New York quotation continuing at $2.10 a barrel, with lighterage extra.

Lubricating Oils

Domestic prices for lubricating oils are unchanged. Some distress material is coming into the market, but not of sufficient proportions to affect prices generally. Domestic motor oils are less firm because of the seasonal falling off in demand. Industrial lubricants, however, are showing a much better tone.

Paraffin Wax

Wax continues firm. There was a particularly good demand for 130-132 a.m.p. refined wax last week and refiners advanced the price one-quarter of a cent a pound to 5 cents.

Petrolatum

Petrolatum continues active. Several carloads of cream, lily white and snow white changed hands during the week at advancing prices. Present quotations are 6 cents a pound for cream, 7½ cents for lily white and 8½ cents for snow white, gains of one-quarter to one-eighth of a cent over the quotations of a week ago. These grades are now selling at the highest levels registered so far this year, and show a substantial gain over those of 1926.

The Export Market

On the whole the export market at New York was encouraging. Lubricants, wax and kerosene were well taken at prices representing the best levels of the year. The demand for bulk gasoline from Europe was somewhat disappointing.

One of the features of the export situation has been the growing demand for industrial lubricants, reflecting a marked gain in industrial activity, especially in Europe. Prices of these grades of lubricants are now moving upward in response to the demand. During the past week 600 steam refined, in barrels, was up one-half a cent to 17 cents. Six hundred Pennsylvania flash, however, was put up 3 cents a gallon. This reflects an increased demand and also recent curtailment by Pennsylvania refiners, making this grade somewhat scarce.

Motor oils for export were in limited demand and prices slipped off. Six hundred Oil City E was down one-half a cent to 24 cents (in barrels). Bright stock witnessed a marked slump, transactions having been recorded substantially below recent levels. Light 135 bright stock was down 3 cents at 40, while dark bright stock was available for 38 cents, also down 3 cents a gallon.

During the past week a large bulk cargo of lubricating oils was shipped to Brazil. It consisted of over 2,800,000 gallons. South America and the Far East were substantial buyers of gasoline and kerosene in cases.

Competitive conditions in Europe were reported about the same, but there were no further price reductions of importance. There is disposition on the part of independent buyers of American gasoline to hold off in the hopes that there will be a seasonal reduction in prices.

A large consignment of petroleum asphalt went out to Australia during the week. It consisted of approximately 25,000 bbls.

Petroleum Exports

The following table shows principal exports of petroleum and petroleum products from New York during the last three weeks (all figures in gallons unless otherwise noted):

	Oct. 12	Oct. 5	Sept. 28
Gasoline:			
Bulk	1,049,291	.....	.....
Cases	779,320	1,108,280	489,500
Kerosene:			
Bulk	623,701	.....	.....
Cases	1,808,860	1,047,760	619,300
Lubricating oil:			
Bulk	4,182,988	.....	.....
Barrels	1,384,850	1,422,900	830,350
Cases	94,860	130,490	104,100
Lubricating grease:			
Barrels (lbs.)	573,750	337,500	1,131,750
Paraffin wax:			
Bags (lbs.)	401,940	1,537,580	514,800
Barrels (lbs.)	1,313,850	3,108,875	112,575
Petroleum asphalt:			
Barrels (tons)	5,740	824	.....

The foregoing figures include all shipments of 500 bbls., 1,000 cases, or over.

Tanker Market and Movement

The oil tanker charter market was active during the past week. A new low record rate for a fixture from California to north of Hatteras, 59 cents, was registered. Previous rate was 65 cents. Since the 59-cent fixture, however, another was reported at 65 cents.

New low rates are in effect Rumanian and Russian oil ports and United Kingdom-Continent. A fixture at 13s. compares with recent average of 14s. 6d.

New fixtures include the following:

Tanker Ligure (Ital.), 2,600 tons, clean, two voyages, Batoun to Alexandria, 13s. 3d., October loading.

Tanker Marisedda (Ital.), 2,200 tons, clean, Constanza to Alexandria, 14s, October loading.

Tanker Gianni (ex Wotan), (Ital.), 8,000 tons, gas oil, Black Sea to Ango Ango, three or four voyages, December loading, 26s.

Tanker Virgilia (Ital.), Black Sea to United Kingdom-Continent, 13s. 6d., October-November loading.

Tanker Woesendrecht (Du.), clean, November loading, Rouen from Gulf, 19s.

Tanker F. K. Lane (Am.), clean, California to north of Hatteras, December loading, 65 cents a barrel.

Tanker Purol (Am.), fixed Shreveport to New Orleans.

Tanker F. K. Lane (Am.), clean, California to north of Hatteras, prompt loading, 59 cents.

Tanker Dean Emery (Am.), October loading, clean, to United Kingdom-Conti-

(Continued on Page 169)

Detection of Sulphur in Petroleum

Qualitative Method for Determining Compounds in Elementary or Combined Form When Content Is Only .02 Per Cent

By F. W. Lane and John M. Devine
Bureau of Mines.

Some months ago the Bureau of Mines began research of a fundamental character on sulphur in petroleum. In the course of this work, the usual qualitative test for sulphur in organic compounds[1] was applied to certain oils that were believed to contain approximately 0.5 per cent sulphur. No sulphur was found, and, as a check on the qualitative test, the oils were subjected to quantitative determination of this element by the oxygen-bomb method[2]. The sulphur content of the oils ranged from 0.10 per cent to 0.50 per cent. This experience led to further trial of the qualitative test for organic sulphur, both on the oils mentioned above, and on common sulphur-containing organic substances. No difficulty was experienced in detecting the element in the latter, but with the petroleum oils the test, as usually performed, could not be relied upon to detect less than 0.60 per cent of sulphur consistently.

The use of mechanically polished pure sheet copper for the detection of free sulphur, hydrogen sulphide, and perhaps other sulphur compounds has been recommended[3]. As it is recognized that this test can not be relied upon to show the presence of all sulphur compounds in oils, attention was concentrated on the usual qualitative test for sulphur as applied to organic compounds.

The heating of organic substances with potassium or sodium for the detection of the elements was employed by Lassaigne[4]. The method was modified later by others in its various details and applications[5]. As the test is usually performed[6], a piece of sodium weighing 0.5 gram (one-quarter-inch cube) is heated in a glass or metal test tube, and the substance to be tested for sulphur is dropped directly into the sodium vapor in the tube. The melt is leached out with water and ethyl alcohol, the solution is filtered, and a small portion of the alkaline filtrate is tested for sulphur with sodium nitroprusside. The details of these operations, as given in the various texts, differ quite widely. Furthermore, the method seems to have been applied mainly to fairly pure solid and liquid organic substances that contain much higher percentages of sulphur than are usually present in petroleum oils. In the interest of the main investigation it is highly desirable to have a method for identifying sulphur in small quantities in petroleum oils before subjecting them to tedious quantitative determination. The object of the present work, therefore, is to modify the usual qualitative test for sulphur in organic compounds so that 0.10 per cent or less of sulphur in petroleum oils may be readily detected.

Test Method

The following method is given for the detection of sulphur in petroleum and petroleum distillates. Reference letters refer to the discussion following the statement of the method[a].

Clamp a 4-inch pyrex-glass test tube[b] vertically in an iron clamp which has been wound with asbestos string of small diameter. Place a one-quarter-inch cube of freshly-cut sodium in the test tube[c]. Apply heat until the sodium melts about one-half inch of sodium vapor is present above the sodium. Remove the source of heat and add immediately 5 drops of the oil to be tested[d]. The oil should be dropped directly into the sodium vapor and not allowed to come in contact with the sides of the hot tube. Replace the burner, heating moderately at first, and gradually bring the lower two-thirds of the tube to a full red heat[e].

When the tube has been thoroughly heated as just described, remove the flame and allow to cool at room temperature. When completely cooled, crush the lower part of the tube and contents in a perfectly dry, clean mortar. Measure out 10 c.c. of distilled water in a small graduate and add a portion of it drop by drop (using a medicine dropper) to the crushed mass in the mortar, letting each drop react before adding the next[f]. When no further reaction is apparent, add the remainder of the 10 c.c. of water cautiously, directly from the graduate[g]. Filter, catching the filtrate in a 10 c.c. graduate. Wash the mortar contents and the filter with sufficient distilled water to make the volume in the graduate 10 c.c. after filtration. Stir the solution in the graduate thoroughly and, using a funnel, place 5 c.c. of it in a specially-designed test tube. (See Figure 1.)

Add a small piece of clean porous tile to the contents of the tube, incline the tube slightly, and add enough hydrochloric acid (specific gravity 1.19) through a funnel to make just acid[h]. Immediately after acidifying place over the mouth of the tube a piece of filter paper which has been folded twice and moistened thoroughly with a solution of lead acetate (normal)[i]. Then boil the contents of the tube gently until steam is seen to condense above the gallery of the tube. Remove the filter paper. If sulphur is present, a distinct brown or black spot will be observed against the white background of the filter paper[j].

[a]The method may also be used for the detection of sulphur in organic compounds, or nonaqueous solutions of organic compounds.

[b]Copper tubes have been used but are not as satisfactory as the pyrex glass tubes because of their tendency to burn through at the temperature most desirable for the test. There seems to be no reason why a copper tube should fail to give the test provided it does not burn through; but it is doubtful whether such a tube has any advantages over the pyrex glass tube. The dimensions of the pyrex tube are approximately: length, 4 inches; outside diameter, seven-sixteenths inch.

[c]It is advisable to use a pair of goggles before beginning to heat the sodium, as small particles of metal may fly out of the tube.

[d]Where the substance to be tested is believed to contain less than 0.10 per cent sulphur, use 10 drops.

[e]Any type of burner that will produce a full red heat in the tube may be used. A lower heat than this is not as satisfactory. Where natural gas is employed it may be advantageous to use a small blast lamp, moving the burner around if necessary to accomplish the heating. The tube must not be allowed to burn through during the heating; and after heating, it must not be broken while still so hot that the sodium takes fire. If either of these things happens the sulphur is oxidized to sulphate by the sodium peroxide formed during the burning of the sodium. Although sulphur, when present in considerable amounts in the original oil, may be detected in the leach solution as sulphate with barium chloride, small amounts of sulphur are not readily detected in this way and may even be missed entirely. The tube should, therefore, be allowed to cool thoroughly at room temperature before crushing in the mortar.

[f]Goggles should be worn during the crushing of the tube in the mortar and also while water is being added to the sodium.

[g]Where the operator is inexperienced in making this test, 3 to 5 c.c. of ethyl alcohol may be used first in taking up the sodium melt, with the later addition of enough distilled water to make a leach solution of 10 c.c. The use of ethyl alcohol in the test, however, is not in general recommended.

[h]When the solution is too strongly acidified with HCl, the lead chloride formed on the paper at the mouth of the tube may mask the black or brown color of the lead sulphide. When this takes place, the presence of sulphur in small quantities may be overlooked. Only 3 to 5 drops of HCl (specific gravity 1.19) in excess should be used. A tiny piece of litmus paper placed in the tube will serve as an indicator.

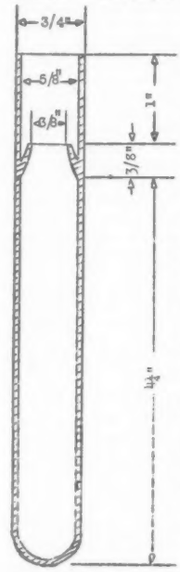


Figure 1—Special test tube made from a Pyrex 6-inch test tube.

[i]This form of tube is suggested to prevent any lead acetate from the moistened filter paper from running down into the solution being tested. If this occurs, the test must be repeated, as the sulphur, particularly when present in only small amount, may be completely precipitated as lead sulphide, from which hydrogen sulphide is not liberated by dilute acids. Sulphur, when present in considerable quantity, may be detected in the leach solution by the addition of lead acetate; but when the amount of sulphur present is very small the precipitate of lead sulphide may be so light as to escape notice.

[j]This test has been found by the writers to be considerably more delicate than the test with sodium ntiroprusside, although the sensitivity of the latter reagent depends to a certain extent upon the concentration of sodium hydroxide. The placing of the filter paper moistened with lead acetate completely over the mouth of the tube insures that all of the hydrogen sulphide will come in contact with lead acetate. Furthermore, the brown or black coloration obtained when sulphur is present is much more readily observed against the white background of the paper than when the latter is introduced entirely into the tube as is usually done. On oils containing as little as 0.02 to 0.03 per cent sulphur, a distinct test is obtained with this method when 10 drops of the oil are used in the heating with sodium. In general, if the leach solution contains 0.004 mg. per c.c. or more of sulphur, the sulphur can be detected in the manner described.

The main course of the experimental work leading to the method given above will be briefly stated.

Experimental Work

The main course of the experimental work leading to the method given above will be briefly stated.

A 1 per cent solution of sulphur (flowers) in petroleum medicinal oil was carefully prepared.[7] By taking definite amounts of this standard sulphur solution and diluting with fresh medicinal oil a series of standard solutions was obtained containing progressively smaller percentages of sulphur. Using these solutions, the details of the method as given above were gradually developed. In the early work it was found that the sulphur in an oil containing 0.20 per cent of this element could be readily detected with the method as given. When the test was carried out as outlined above (except that the use of lead acetate was replaced by adding sodium nitroprusside (1:500) directly to the alkaline leach solution) a very faint coloration was obtained with the oil containing 0.20 percent sulphur. Fairly positive results were obtained in this way with oils containing 0.30 per cent of the element.

The next work was done on three crude oils, containing respectively 0.2, 0.3 and 0.4 per cent sulphur as determined by the oxygen-bomb method. Sulphur was detected in all three of these, both with sodium nitroprusside and with lead acetate, although the test with the nitroprusside was very weak in the case of the 0.2 per cent oil. Lead acetate, when applied as outlined in the method above, gave a very positive test, even with the crude containing 0.2 per cent sulphur.

Tests were also performed on a sample of Cabin Creek crude, containing less than 0.1 per cent sulphur as determined by the oxygen-bomb method. Three trials were made, using respectively 5, 10 and 15 drops of the crude oil in heating with sodium. In none of the tests could a coloration be obtained with sodium nitroprusside, but in each case a very definite indication was obtained with lead acetate when used as directed in the method above given. This gave a very clear indication that the use of lead acetate, as here carried out, affords a more delicate test for sulphur than sodium nitroprusside.[8] The delicacy of the test with lead acetate was further confirmed on an oil containing 0.04 per cent sulphur. A very positive indication was obtained.

To determine whether the method could be applied for the detection of sulphur in very volatile petroleum products, five drops of the original 1 per cent sulphur solution in petroleum medicinal oil were diluted with 10 c.c. of sulphur-free natural-gas gasoline. Five drops of the gasoline solution so prepared were used for the test which was made as outlined above, using lead acetate. A positive indication for sulphur was obtained. The gasoline solution contained approximately 0.02 per cent sulphur.

To check up the work on detection of sulphur in small concentrations, a solution of sulphur (flowers) in petroleum medicinal oil was prepared containing 0.097 mg. sulphur per gram of solution, or 0.085 mg. per c.c. of solution (equivalent to 0.0097 per cent sulphur). Ten drops of this solution were heated with sodium and a positive test thus obtained using lead acetate.

To determine whether sulphur in a stable organic compound could be de-

[1]Mulliken, S. P., "A Method for the Identification of Pure Organic Compounds," Vol. 1, pp. 10-12. The test is described in nearly all textbooks and laboratory manuals of organic chemistry.

[2]Proc. Am. Soc. Testing Materials, 1922, Part 1, p. 777. Method D 129-22 T. See also United States Bureau of Mines Technical Paper 323A, United States Government Specification for lubricants and Liquid Fuels and Methods for Testing, p. 84.

[3]Waters, C. E., United States Bureau of Standards Technologic Paper No. 177, Sulphur in Petroleum Oils, p. 8. See also Proc. Am. Soc. Testing Materials, 1922, Part 1, p. 780, Method D 130-22 T.

[4]Lassaigne, Compt. rend. 16, 387, (1843).

[5]Remsen, Ann. 3, 134 (1881-2). Kehrer, Ber. 35, 2,523 (1902). Grabe, Ber. 17, 1,178 (1884). V. Konek, Z. Angew. Chem. 17, 771 (1904). Taube, Ber. 32, 3,150 (1899); Chem. Ind. 26, 26 (1903).

[6]Mulliken, S. P., Work cited.

[7]As near as could be determined, the medicinal oil contained about 0.01 per cent sulphur. Determination of sulphur in the 1 per cen. solution by the Carius method showed the method of preparing the solution to be amply accurate for the work at hand.

[8]See also Treadwell-Hall; Analytical Chemistry, Vol. 1, 5th English Edition, p. 357.

tected as readily as the elementary sulphur in the medicinal oil, pellets were prepared consisting largely of highly purified benzoic acid with a small quantity of normal butyl sulphone. With these it was possible to detect 0.1 mg. sulphur per c.c. in the final solution using the method given above with lead acetate. In another case that was carefully studied, a solution of normal butyl sulphone containing 0.0094 per cent sulphur was prepared in petroleum medicinal oil. Ten drops of this solution, equivalent to 0.024 mg. sulphur, were used in the reaction with sodium, making a concentration in the leach solution of 0.0024 mg. sulphur per c.c., assuming that no sulphur is lost in the operation. A positive test for sulphur was readily obtained.

In preparing the solutions of free and combined sulphur in the petroleum medicinal oil, it was assumed that the oil was free from sulphur. All of the calculations given above were made on that basis. The assumption is not entirely warranted, however, as the medicinal oil was shown to contain about 0.01 per cent sulphur. Hence the lower limit of the amount of free or combined sulphur that can be detected by the method is placed at about 0.02 to 0.03 rather than 0.01 per cent.

The following work gives some indication of the relative sensitiveness of sodium nitroprusside as used in the qualitative test for sulphur. Preliminary tests were made on a solution of sodium sulphide of such strength that it just failed to give the test with sodium nitroprusside. This solution gave a positive test for sulphur with lead acetate with or without the addition of a small amount of ethyl alcohol. A portion of the original sodium sulphide solution was then diluted with nine parts of water (by volume) and still gave the test with lead acetate. The use of alcohol with this more dilute sulphide solution seemed to make the test with lead acetate a little less distinct, although it was still positive. An aqueous sodium sulphide solution, of such strength that it just gave the test with sodium nitroprusside before alcohol was added, also gave the test after alcohol was added. In the latter case, however, the color appeared to be more transitory.

Relative Test

In order to test more carefully the relatile sensitiveness of sodium nitroprusside and lead acetate in this test, an aqueous solution of sodium sulphide was made up containing 0.0872 mg. sulphur per c.c. Solution A was made from this by diluting 1 part with 19 parts (by volume) of water; solution B was prepared by diluting 1 part of the original solution with 39 parts (by volume) of water. Tests with solutions A and B showed the following results:

Solution A — Containing 0.00436 mg. sulphur per c.c. No test with sodium nitroprusside (1:500) even when added in much greater quantities than five drops. Faint test when considerable amounts of sodium nitroprusside (1:100) were added. Distinct test with lead acetate when applied as in the method on page 3.

Solution B—No test with sodium nitroprusside of either concentration (1:500 or 1:100) even when added in considerable amounts. Distinct test with lead acetate.

The concentration of sodium hydroxide has a very distinct effect on the color obtained with sodium nitroprusside as indicated in the following tests:

Test Number	Aqueous solution of sodium sulphide containing 0.0872 mg. sulphur per c.c. Amount used for test, c.c.	Saturated NaOH Solution Added, c.c.	Result on addition of definite amount of sodium nitroprusside.
1	10	1	Distinct coloration
2	10	2	Distinct coloration
3	10	3	Fain. coloration
4	10	4	No coloration
5	10	4 (Acidified with HCl then made just alkaline.)	Distinct coloration

The test for hydrogen sulphide, involving the formation of methylene blue,[9] was quite carefully tried out to determine its possible applicability to the present work. As was suspected, the test proved to be far too delicate for every-day use in the laboratory.

The inadequacy of the copper-strip test for the detection of certain forms of sulphur in petroleum oils[10] was confirmed by the following experiment: Two solutions in petroleum medicinal oil were prepared, (a) containing 0.10 per cent of elementary sulphur, and (b) containing 0.10 per cent sulphur in the form of normal butyl sulphone. At 100 degrees Centigrade solution (a) blackened a copper strip immediately, while solution (b) produced no visible tarnishing of the metal after an hour's time.

Blank tests were made on all reagents used in the work described in this paper.

Summary

A test for the qualitative detection of sulphur is given that differs somewhat in detail from the usual procedure. Each step in the procedure has been carefully studied. Assuming that the petroleum medicinal oil used in the above tests contained about 0.01 per cent sulphur, it is probably fair to state that the test will detect sulphur in the elementary or combined form in petroleum oils when present to the extent of only 0.02 to 0.03 per cent. This is much more sensitive than the test as usually carried out using sodium nitroprusside.

[9] Emil Fisher, Ber., 16, 2234 (1883).

[10] Waters, C. E. Loc. cit.

ROCKY MOUNTAIN AREA

(Continued from Page 62)

big sand in the lower Pennsylvanian, and unless something develops shortly, the test probably will be abandoned.

The Texas Production Co.'s No. 1 Shipley, Section 5-27-14, Sweetwater Dome, is running 12½-inch casing at 1,560 feet, and the Union Oil Co. of California's No. 1 State, Section 16-30-25, Lisbon Dome, is drilling in salt with occasional limey breaks at 4,625 feet.

When the No. 1 Frank Shafer, Section 6-27-21, Cane Creek Dome, was opened up the past week, it was found that 800 feet of oil was standing in the hole. A gauge on the bradenhead between the 4¾ and 6¼-inch casings showed a pressure of 850 pounds. This pressure is coming from the 3,650-foot horizon which had a large show of oil and gas and which has continued to show oil and gas for the past year. The well was drilled to 5,000 feet by the Midwest Exploration Co. and was recently taken over by the Utah Southern Oil Co. This is the operation which in December, 1925, started the big wildcat play in southeastern Utah. The 4¾-inch casing is being pulled and a test of the several horizons showing oil will be attempted.

Montana

The Texas and Pacific Coal & Oil Co. has decided to enter the Montana fields under its own name. This company has operated heretofore as the Homestake Exploration Co. which the Texas and Pacific took over some years ago.

Six wells are now drilling on the Bannatyne structure north of Great Falls. However, the past week has set back this operation to some extent. The Elliott well is a duster and the O'Neil No. 2 is another dry hole. Both wells are in Section 13-26-2. The O'Neil well found sulphur water in the Ellis sand which gives promise of a pool in the vicinity. This well was found to be 87 feet lower than the O'Neil No. 1.

In the Sunburst Field the past week was a large number of completions. The Dakota Montana Oil Co. has a new producer in Section 7-34-1 that will make 100 bbls. and another on the same section that came in a dry hole. Both wells were drilled to the Ellis sand.

The Hannah Porter Oil Co. brought in the prize of the week in the No. 2 in Section 7-34-1 which started off at 1,000 bbls. This well is in the southeast pool that extended the field last spring and shows that this pool is by no means defined yet.

The Meows Oil Co.'s No. 1 on the Adams came in in Section 12-34-2 with a production good for 300 bbls. and the Carter Oil Co. has a 35-bbl. well in Section 11-35-2.

The P. M. K. Oil Co. drilled in a producer good for 45 bbls. in Section 19-35-1 and the Standard of California has a producer good for 12 bbls. in Section 22-35-2.

The Blue Sage Oil Co. has a 150-bbl. well in Section 8-34-1, the Marharg Goeddertz syndicate has a producer good for 30 bbls. in Section 23-35-3. The Western Drilling Co. brought in a small pumper in Section 30-35-1 and the 56 Petroleum Co. has another of the same kind in Section 32-35-1. The Shelby Oil & Gas Co. struck a gasser in Section 23-32-2 estimated good for 9,000,000 feet.

ROCKY MOUNTAIN PRODUCTION
Runs From the Fields

Wyoming	
Salt Creek	32,600
Teapot	830
Big Muddy	2,730
Grass Creek	2,620
Elk Basin	1,050
Greybull	20
Dutton Creek	20
Notches	190
Rock River	2,690
Rex Lake	140
Lance Creek	600
LaBarge	480
Mule Creek	730
Poison Spider	485
Hamilton	610
Osage	330
Lander	650
Pilot Butte	310
Ferris	70
Byron	60
Lost Soldier	2,600
Simpson Ridge	90
Montana	
Cat Creek	2,030
Lake Basin	230
Kevin Sunburst	11,500
Colorado	
Florence	921
Moffat	1,506
Fort Collins	2,778
Walden	51
Iles Dome	470
Rangely	100
Tow Creek	543
Boulder	25
New Mexico	
Rattlesnake	404
Hogback	260
Cap Rock	121
Table Mesa	....
Artesia	1,405
Total	72,249

PRINCIPLES OF AIR-GAS LIFT PRACTICE

(Continued from Page 106)

from the hole, thus keeping the hole clean. However, it also can be so applied as to paraffin up a sand.

It seems doubtful whether the gas-lift has any important effect on recovery other than the back pressure applied against the face of the sand; therefore, the discussion of the air-lift upon efficiency of oil recovery comes back to the same controversial question as to the use and utility of the back pressures. Without presenting evidence or analytical reasons for their opinions, the writers merely wish to state that they believe that the back pressure will be beneficial or not wholly in accordance with the degree of pressure applied and the manner of applying it in relation to the local conditions. When the junior author discussed this subject in Bulletin No. 148 of the Bureau of Mines, he called attention to the fact that too high a back pressure would be detrimental, but, on the other hand, there was much evidence that at some point there would be a back pressure for each condition which would be beneficial just as there has been shown to be an optimum submergence for the air-lift with relation to the other concurrent conditions.

A high back pressure prohibits the full expansion of gas and thus lessens the amount of energy delivered by it. On the other hand, if the gas is allowed to expand to its maximum extent, the additional work delivered will be largely consumed in greater velocity and, therefore, greater friction, so that additional useful work theoretically available will be small. Furthermore, there is good reason to believe that the higher velocities created will result in greater slippage of the gas through the sand and it has been shown by Henry L. Doherty that the taking the gas out of solution from the oil will also have an important and seemingly detrimental effect on the physical properties of the oil.

These lines of evidence are reasoned out by a careful consideration of the results from applying back pressure both under artificial pressure and under natural pressure. The seemingly irreconcilable results reported by various observers of back pressures both when used with air-lifts and elsewhere can be explained by the fact that account must be taken of the limited range in which back pressure can be advantageously used, which, if either less or more, will be harmful.

If the writers are correct in their conclusions, the effect of the air-lift upon oil recovery is to be measured by the back pressure created by it and the air-lift should be designed and operated at a pressure to conform with the back pressure giving the best results in oil recovery.

These considerations, however, are limited by the practical ones of the competitive conditions at the well and therefore the necessity for getting the highest daily production. Not until a great deal more observational data has been collected and analyzed can it be known how to work out the use of back pressures and how to design the air-lift so as to get the back pressures desired, and at the same time have an efficient air-lift within the limits imposed by the size of the casing and other economic and practical conditions.

It may at first thought seem that the air-lift, which in a deep well may be imposing several hundred pounds of pressure on the well, would create a back pressure instead of lessening the back pressure, but, actually, a naturally flowing well may have a greater back pressure on the sand than is necessary to lift the oil by the air-lift and this is even true with a pumping well. If for any reason the oil coming into the well is not removed as fast as it enters, it heads up in a well and exerts a big back pressure as has been shown in discussing Figure 1. This will take place if the pump has not sufficient capacity or in a flowing well if the pressure and volume of the gas does not supply enough energy to lift the oil rapidly. Under these conditions the air-lift by removing the accumulated column of oil will actually reduce the pressure on the sand.

Need for Better Information

Tests made on the deliveries of air compressors have disclosed that assumptions as to their delivery, horsepower and efficiency based upon manufacturers' claims and ratings are very unreliable and conclusions founded upon such data should not be accepted. As operated in the field, a compressor is not of the same efficiency as when tested on the floor at the factory. Analogous errors have been noted in other observational data, and until the information gathered in the field is more complete and dependable progress in air-lift engineering will not be satisfactory.

PENNSYLVANIA MARKETS

OIL CITY, Pa., Oct. 15.—Gasoline and naphtha continued to be weak in the Pennsylvania refined market during the week with a reduction in some of the prices for some of the grades being posted by some of the refiners in the State. Actual consumption was also less during the week as the result of cold weather. Kerosene was still strong and it has been the best feature of the market. Neutral and fuel oil showed no change. Wax was stronger with a better demand and firmer prices. Bright stocks were weaker than they had been and cylinder stocks also showed less demand.

DEATH OF GEORGE A. RUMSEY

OIL CITY, Pa., Oct. 15.—An illness of several weeks resulted in the death of George A. Rumsey, a prominent resident of Clintonville, in his seventy-second year. He was engaged for many years in the oil producing business in partnership with Harry Lamberton, of Franklin.

NEW OIL COMPANY

CHICAGO, Oct. 17.—The Peoria Oil & Gasoline Co. has been organized at Peoria, Ill., by Harold and Ralph Lynch and Walter McMorris to deal in petroleum products. The address is 422 North Adams Street, Peoria, Ill.

REFINING AND MARKETING

JONES WILL ADDRESS INDEPENDENT OIL MEN

CHICAGO, Ill., Oct. 15.—Roy Jones, president of the Panhandle Refining Co. and a vice president of the Western Petroleum Refiners Association, will speak at the annual meeting of the Independent Oil Men of America, according to an announcement by L. V. Nicholas, president of the association. Mr. Jones will speak on the subject "The Independent Refiners' View — Why We Put the Spread Eagle on Our Tanks." The Panhandle company is one of the refinery members of the association which has taken an active interest in its advertising program.

The program of the annual meeting which will be held at the Congress Hotel, Chicago, October 24, 25 and 26 will be largely devoted to the discussion of the association's co-operative marketing and advertising program. On the afternoon of the first day Mr. Nicholas will deliver the keynote address on the subject "Spread Red Eagle." On the second day J. L. Marsh, Valley Oil Co., Youngstown, will speak on "Organized for Profits." C. Y. Hinchey, director of advertising for the association, will speak on "Equipment Hookups, a Co-ordinated Major Line." T. A. Peck, in charge of the association's lubricating oil marketing program, will discuss "Red Hat Motor Oil, a $10,000,000 Asset."

On the third day W. G. Leamon, inventor of a vapor phase cracking process which produces the antiknock gasoline known as "Stellarine," will speak on the subject "Stellarene, an Ethyl Gasoline Equivalent." It is said that the association is considering the marketing of this product in competition with ethyl gasoline. Mr. Jones will speak on the same day.

There will be no equipment displays at the fall meeting which is the first to be held since the merger of the Independent Oil Men of America and the National Petroleum Marketers Association. No special entertainment features are to be provided.

INDUSTRIES LARGEST USERS OF FUEL OILS

Domestic fuel oil consumption, including fuel oil and gas oil, amounted to 443,980,000 bbls. in 1926, according to H. J. Struth, petroleum economist. This includes fuel used by the United States navy and the marine. The industries are credited with taking about one-third of the total amount. The detailed estimate of the consumption by the various divisions follows:

Industries, 137,531,000 bbls.; marine, 76,691,000; railroads, 59,682,000; refineries, 52,200,000; domestic heating, 25,000,000; gas manufacturers, 23,000,000; power plants, 9,376,000; United States navy, 6,500,00; total, 389,980,000 bbls.

In addition to this domestic consumption exports amounting to 38,347,000 bbls. increased the total fuel oil supplied to 428,327,000 bbls.

GRANT NEW HEARING

The Texas Railroad Commission has granted the Kansas City & Orient Railroad Co. a rehearing on its application to have freight differentials on refined petroleum products and crude oil removed. The case was originally heard at Fort Worth, Tex., on September 13 of this year and the refusal to grant the application was made on September 17.

The Orient's application asks for the removal of differential rates on refined oil and crude oil moving from McCamey, Tex., east over that railroad to all points in Texas. The Interstate Commerce Commission and the Texas Railroad Commission heard the case jointly.

GREATER USE OF FURNACE OIL SOLUTION FOR OVERPRODUCTION

NEW YORK, Oct. 15. — The growing use of oil for heating homes and commercial buildings and the effect of this increase upon the entire oil industry were the principal subjects discussed by the directors of the American Oil Burner Association at their meeting in Philadelphia on October 11 and 12. Far-sighted oil companies, it was reported, believe that in the 25,000,000 homes of the country lies the solution of the problem of overproduction. As one member expressed it, "the time is approaching when the home will utilize the greater part of the products remaining after the manufacture of gasoline by the cracking process."

The large integrated companies who have been forced to store a large part of their output for lack of a profitable market are paying close attention to the development of the domestic oil burner and looking forward to the time when the use of oil as a household fuel throughout the United States and Canada will go a long way toward balancing the rapidly growing production of gasoline. Lionel L. Jacobs, of Toronto, president of the association, pointed out that with present production, there is enough crude petroleum in the country to furnish fuel to heat one out of every four homes. "Oil is no longer the fuel of the future," he said, "it is the fuel of the present. When we take into consideration the saving in labor, the superior cleansing, healthfulness and economy of automatic heat, oil must be given first rank as a fuel for domestic purposes. The 25,000,000 bbls. of oil now used for domestic heating out of a total consumption of nearly a half million barrels shows the enormous opportunities for expansion in the sale of fuel oil for this market."

The directors agreed that the help of more oil companies should be sought in the 1928 educational program of the Oil Heating Institute, which is teaching consumers to appreciate the cheapness of oil fuel and its possibilities for domestic heating purposes. The Standard Oil Co. of New York, Gulf Refining Co., Cities Service Refining Co., Crew Levick Co., Tide Water Oil Co. and Associated Oil Co., Sun Oil Co. and the Pure Oil Co. subscribed to the institute's work during this year. It was declared that as soon as the householder understands that every new automobile means an increase in the supply of fuel oil, he will realize that the use of oil for domestic heating is a sound conservation policy.

Relation to Gasoline

One of the directors called attention to the fact that fuel oil bears the same relation to the gasoline industry that glycerin bears to the soap industry. Glycerin is a by-product of the manufacture of soap. Through their success in finding outlets for glycerin in the arts, in the manufacture of explosives and as an antifreeze mixture for automobile radiators, the soap manufacturers have prospered notwithstanding their high selling costs due to intensive competition.

Another speaker emphasized the need of showing the consumer that far from reducing the supply of fuel oil, the growing demand for gasoline increases fuel oil production and reduces the price of this commodity. Proof of this is the fact that fuel oil is one of the few widely used commodities which has decreased in price during the past 10 years, notwithstanding the tremendously enlarged demand.

The board of directors received a report on the campaign of consumer education carried on since June 1 by the Oil Heating Institute and signified their satisfaction with the results by voting to continue the campaign during 1928 and to raise an advertising and educational fund of at least $250,000 for this purpose. Lead D. Becker, managing director of the institute, reported that as a result of this campaign the institute was receiving an average of 1,000 inquiries a week for information about oil heating and that a large proportion of these inquiries had been traced to actual sales.

Progress was reported in overcoming objections to oil heating, chief among which, it was said, was the idea that it is more expensive than coal heating. Those present agreed that one of the most important factors in convincing the consumer that oil fuel costs no more than coal, and in many cases less, is the installation of adequate household storage tanks. In many instances, it was said, the impression that oil heat costs more than coal heat is entirely psychological, due to the fact that many users equipped with small storage tanks have their oil delivered in small quantities, and the receipt of weekly or semimonthly bills based on frequent deliveries may give the householder an exaggerated impression of fuel oil costs. One member told how he had convinced a customer that her oil was costing her less than coal by an actual comparison of oil and coal bills. Dealers will be urged to show their customers the importance of installing storage tanks large enough to hold a delivery of from 1,000 to 2,000 gallons, the latter quantity being enough to serve the average heating plant throughout the winter.

The campaign of dealer education by the Oil Heating Institute will undertake not only to show the consumer how to figure costs on a fair basis, but also demonstrate the so-called "intangible" advantage of automatic oil heating—its cleanliness, its healthfulness and its effectiveness in releasing the housewife from domestic drudgery. It was decided to hold the next annual meeting of the association at the Hotel Stevens, Chicago, on April 3, 4 and 5.

REIBER TAKES CHARGE OF TEXAS EXPORT SALES

NEW YORK, Oct. 17.—T. Reiber, who was elected vice president of The Texas Company in charge of export sales resigned from the Galena Signal Oil Co. early this month to assume his present position. He originally started with The Texas Company in 1906 as captain of one of the company's first three tankers. About six years later he assumed charge of company's New York terminal from which capacity he was transferred to Port Arthur refinery as assistant superintendent. He was promoted shortly to superintendent but left The Texas Company in 1920 to go with Galena Signal. Mr. Reiber left for Europe a week ago to join R. Cholmes, president of the company, in a trip covering The Texas Company's European properties.

INVITES OIL MEN

CHICAGO, Oct. 15.—The management of the Indian Refining Co. has extended an invitation to the oil men present at the fall convention of the American Oil Men's Association at West Baden to visit its refinery at Lawrenceville. The exact date has not been set. The visit may take place on the day following the final session on November 4. The distance from West Baden to the refinery is not great and arrangements will be made for the convenient transportation of the oil men who may wish to visit this modern refining plant.

WORLD FLIER TO SPEAK AT A.O.M.A. MEETING

CHICAGO, Oct. 15.—James Gilmore, secretary of American Oil Men's Association, states that among the attractions at the West Baden convention November 23 and 24 of the association will be one of the lucky world flyers. Ed Schlee, of the Wayco Oil Corp., of Detroit, Mich., backer and one of the participants in the flight of the "Pride of Detroit," will appear in person and address the members on the night of the banquet. His talk will be on "Personal Experiences on My World Flight." He promises to fly his airplane, the "Pride of Detroit" to West Baden, where it will be on inspection.

Other addresses are scheduled of great interest and value, among them being that of Dr. G. G. Brown, professor of chemistry at the University of Michigan and a recognized expert of antiknock motor fuels. He is to demonstrate the testing of samples. H. C. Mougey, chief chemist, General Motors Research Laboratories, will speak on "Factors Affecting Lubrication"; H. L. Fogleman, vice president Sheldon School of Salesmanship, "Salesmanship vs. Price Cutting"; L. G. Heads, the Blackman Co., "Advertising."

A complete program of entertainment has also been prepared.

LEASES TERMINAL

The North American Car Corp. has leased the oil terminal of the Missouri-Kansas-Texas Railway at Galveston, Tex., and through its subsidiary, Gulf States Terminal & Transport Co., is operating the plant in conjunction with its export terminal at New Orleans, built last year.

More than 5,000 carloads of oil have been handled thus far in 1927 and current contracts cover various commodities including crude and refined products for export.

ASK FOR BIDS

WASHINGTON, D. C., Oct. 17.—The United States Navy Department has called for bids on 2,866,700 gallons of motor gasoline to be delivered at east coast points to cover its estimated requirements from January 1 to June 30, 1928. Bids on 1,070,000 gallons of domestic aviation gasoline for delivery at the same points during the corresponding period also were requested.

Proposals will be opened at the department on Wednesday, November 16.

STEWART LEAVES ACME

CHICAGO, Oct. 17.—L. A. (Al) Stewart has severed his connection with the Acme Petroleum Co. of this city. Mr. Stewart has been connected with several large organizations, having been vice president of the Refiners Petroleum Co. of this city up to the time of joining the Acme forces. He will take a brief rest before re-entering business.

CHICAGO OIL RECEIPTS

CHICAGO, Oct. 15.—The city inspector's office reports the following receipts of petroleum products in the city and inspected by the department during September: Gasoline, 473,038 bbls., of 50 gallons each; kerosene, 9,389 and naphtha, 18,750.

FRENCH TARIFF LOWER

NEW YORK, Oct. 15.—The new French tariff provides for a lower import duty on crude petroleum. The new rate is 20 francs per 100 kilos. The duty on paraffin oils is 32 francs per 100, and on gasoline 40 francs per 100.

Brief Items for Plant Operators

Use of Flash Drum In Dubbs Operation Reduces Coke Output

A method of handling the residuum in the Dubbs cracking operations which materially reduces the amount of coke produced, lengthens the cycle of operation and results in other operating economies is now being used at the refineries of the Vickers Petroleum Co., Potwin, Kans. and the Derby Oil Co., Wichita. The main feature of the operation were explained last week at Wichita by A. M. Schrepfer, superintendent of the Vickers plant, at a technical meeting held under the auspices of the Western Petroleum Refiners Association. The new method of operation was developed at the Vickers plant where it has been used for several months.

The company management decided to try out the operation after changes had been made in the two Dubbs units which were installed at the Vickers plant in 1923. The changes included the replacement of the 10 by 10-foot reaction chambers with 10 by 30-foot units. The new chambers were installed without moving the old chambers. The management then conceived the idea of using the old reaction chambers as secondary reaction units or flash drums.

The operation of the Dubbs units at the Vickers plant does not differ from the ordinary Dubbs operation so far as the main features are concerned. However, instead of allowing liquid to collect in the reaction chamber it is drawn off continuously to the old reaction chamber or flash drum. Several draw-off lines at different heights connect the reaction chamber to the flash drum.

Operating Method

Between the reaction chamber and the flash drum is a reducing valve which lowers the pressure from approximately 200 pounds in the former to 50 pounds in the latter. At this reduced pressure the liquid residuum is allowed to vaporize in the flash drum. The part which vaporizes passes to another drum about 30 feet in height and 12 inches in diameter. In this tower or drum the vapors are brought in contact with the incoming fuel oil charge. This serves to condense the vapors and at the same time preheat the charge. The liquid which is not vaporized in this flash drum passes out to storage. This fuel oil while low in gravity is a commercial grade of fuel with no carbon in suspension.

This method of operation as explained by Mr. Schrepfer has several advantages over the old operation. In the first place it has increased the cycle of operation from four or five days to an average of approximately 20 days. This longer cycle is due to the fact that relatively little coke is formed. The longer cycle has also reduced the labor cost. A much smoother and an easier controlled operation is also claimed for the new method without any sacrifice in yields.

The new 10 by 30 reaction chambers were installed at the Vickers plant before the new method was devised. In the opinion of C. L. Henderson, vice president of the Vickers company, it would not have been necessary to have installed the large chambers. The purpose of the large chambers which have been installed at many Dubbs plants is to lengthen the cycle of operation by increasing the coke capacity. With the supplementary flash drum it is apparent that this demand has been greatly modified and a smaller chamber would give equally satisfactory results.

The fact that a smaller quantity of coke is formed is explained as being largely due to the fact that the flash drum furnishes a means of allowing the liquid to evaporate at relatively low pressures after the light ends have passed overhead from the reaction chamber. By mixing the light ends of the residuum from the reaction chamber with the incoming charge it is also possible to increase the recycle ratio of the entire operation. This also tends to reduce the coke formation. The charging stocks for the cracking units at the Vickers plant is a 24-26 gravity fuel oil obtained from the refinery's skimming operation.

The same operating principle is also being used at the Wichita plant of the Derby company. The company has just finished an improvement program at its four Dubbs units and last week started operating the first two units. Its method of operation differs from that at the Vickers plant in that atmospheric pressure is maintained on the flash drum.

A unique feature of the Derby installation lies in the fact that the fuel oil residuum from the flash drum is dropped into another drum from which it is recirculated through a fuel line from which the Dubbs cracking units are fired.

NEW REFINERY TO BE BUILT AT WICKETT, TEX.

FORT WORTH, Tex., Oct. 18—Southern Crude Oil Purchasing Co. is moving in part of the Elliott & Jones refinery which was purchased some time ago at San Antonio, and plans to erect it on a newly-purchased site at Wickett on the Texas & Pacific Railroad. According to present plans it will be a 3,000-bbl. skimming plant and will be in operation about November 15. It will be operated under the name of the Blue Bonnet Oil & Refining Co. as a subsidiary of Southern Crude.

The Pure Oil Co. purchased an 80-acre tract at Wickett for future use as a tank farm and loading rack but definite plans are yet undecided pending further developments in the Hendricks Pool. Pure is grading for one 55,000-bbl. tank in SE Section 34, Block 5-B.

Atlantic Oil Producing Co. has surveyed route for a pipe line from Winkler County to its new tank farm at Midland and has bought an 80-acre tract at Wickett for a tank farm and loading rack. Those who ought to know expect to see seven pipe lines in Winkler County either constructed or definitely started within the next few months. The Southern and the American are already in. Humble, Roxana and Atlantic have surveyed routes. The others anticipated are Gulf and Magnolia and possibly Prairie.

NEW PIPE STILLS

The Skelly Oil Co. has started operating two new pipe stills at its El Dorado, Kans., refinery. At the present time the two units which have a capacity of 3,500 bbls. each are being operated with fuel oil from the skimming plant. As reducing stills, a large gas oil cut is taken overhead for use as charging stock in the cracking stills. The pipe stills are designed so that they can be used if necessary in a skimming operation with crude oil as charging stock.

GAS CONTENT IN TANKS

In the publication of a paper by Ralph E. Motley of the Atlantic Refining Co., in the October 6 (page 130) issue of The Oil and Gas Journal it was stated in regard to tanks: "If the detector shows more than a 25 per cent gas content no work is done unless masks are used." The actual gas content is 25/100 per cent and not 25 per cent.

AMONG THE TECHNICAL MEN

C. L. Brown, general superintendent of natural gasoline plant operations for the Sinclair Oil & Gas Co., has been connected with that phase of the oil industry activities from the time it first began to have a commercial significance. His first employment was at a plant owned by B. B. Jones, located near Oilton, Okla., in 1914. The natural gasoline industry was in its infancy in the Mid-Continent Field at that time.

C. L. Brown

Mr. Brown previously had spent one year in general lease work on properties owned by Frank Brown and associates. After his first experience at the Jones plant he was employed in the natural gasoline department of the Standard Oil Co. of Indiana.

In April, 1917, he became connected with the Sinclair Oil & Gas Co. in gasoline department. A few weeks later he was made superintendent of one of the company's plants.

During the more than 10 years Mr. Brown has been with the Sinclair company he has held various engineering positions with the gasoline department. He has been general superintendent for the past two years. During the 10-year period he has been with the company its natural gasoline operations have expanded rapidly so that it is now one of the major manufacturers of the industry.

Mr. Brown and his associates in the Sinclair company have been especially active during the past year due to a large construction program in the new Seminole area of Oklahoma. The output of plants constructed in that section during the past few months has added approximately 225,000 gallons daily to the company's natural gasoline output.

ISSUES BOOK ON USE OF NATURAL GASOLINE

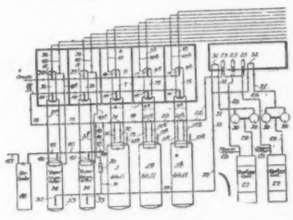
The Association of Natural Gasoline Manufacturers are now ready to distribute a complete summary of Dr. G. G. Brown work on the use of natural gasoline as a motor fuel. Doctor Brown has supervised the work of the technical committee of the association and has arrived at some very definite conclusions regarding the effect of volatility and the antiknock properties of natural gasoline when blended with various refinery gasolines.

The new book contains all of the data and including the results of work done since the publication of his work in Bulletin No. 7, issued by the University of Michigan. These new books will be supplied from the offices of the Association of Natural Gasoline Manufacturers, Cosden building, Tulsa, Okla., at a cost of $1 plus postage.

Recent Patents

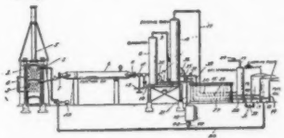
(Additional Patents on Page 206)

1,640,938. Art of Distilling Oils. Frank A. Howard and Nathaniel E. Loomis, Elizabeth, N. J., assignors to Standard Development Co., a corporation of Delaware. Filed April 10, 1922. Serial No. 551,354. 11 Claims. (Cl. 196—49.)



2. The method of distilling and converting hydrocarbon oils which comprises continuously performing the following steps in succession: passing the oil through a heated zone not substantially above atmospheric pressure, removing vaporized constituents therefrom during said passage, heating the residues to a conversion temperature while under pressure, reducing the pressure on the products of conversion, separating vapor from liquid products and commingling separated liquid products of conversion with fresh oil entering the process.

1,643,446. Process for Treating Petroleum Hydrocarbons. Walter M. Cross, Kansas City, Mo., assignor to Gasoline Products Co., New York, a corporation of New York. Filed August 13, 1924. Serial No. 731,749. 1 Claim. (Cl. 196—51.)



A process for treating petroleum hydrocarbons comprising raising the oil to a cracking temperature in a heating stage, collecting all the oil to be treated in a reaction stage while maintaining temperature and pressure conditions adapted to effect conversion while the oil is substantially in the liquid phase, withdrawing all the conversion products from the reaction stage in a relatively small stream, releasing the pressure on the stream and injecting steam into the flowing stream, admitting the mixture of oil and steam to an enlarged zone maintained at reduced pressure to distill off the lighter fractions of the converted products.

REFINERY AND CRUDE PRICES

Quotations on Principal Refined Products and Crude Petroleum Markets in All the American Oil Fields

GASOLINE AND NAPHTHA

	Oct. 18		Oct. 11		Oct. 4	
OKLAHOMA (Group 3)—						
50-52 450 endpoint (Naphtha)	.05¾	.06	.05⅞	.06	.06	
56-58 450 endpoint	.05¾	.05⅞	.05¾	.05⅞	.05⅞	.06
58-60 450 endpoint	.05¾	.05⅞	.05¾	.05⅞	.05⅞	.06
58-60 437 endpoint (U. S. Motor)	.06	.06¼	.06	.06¼	.06	.06¼
60-62 400 endpoint	.06½	.06⅝	.06½	.06¾	.06½	.06⅝
64-66 375 endpoint	.06¾	.07	.07	.07¼	.07	.07⅛
68-70 360 endpoint	.07⅛	.07¼	.07¼	.07½	.07¼	.07⅜
64-66 437 endpoint (blend)	.06	.06¼	.06	.06¼	.06⅛	.06¼
KANSAS—						
58-60 437 endpoint (U. S. Motor)	.06¼	.06⅜	.06¼	.06⅜	.06¼	.06⅜
NORTH TEXAS—						
56-58 437 endpoint	.05¾	.05⅞	.05⅞		.05⅞	
58-60 450 endpoint	.05¾	.05⅞	.05¾	.05⅞	.05¾	.05⅞
58-60 437 endpoint (U. S. Motor)	.05⅞	.06	.05⅞	.06⅛	.06	.06⅛
60-62 400 endpoint	.06⅜	.06½	.06½		.06½	
64-66 390 endpoint	.06⅝		.07			.07
64-66 375 endpoint	.06¾		.07	.07⅛	.07	.07¼
68-70 360 endpoint	.07¼		.07¼		.07¼	
64-66 437 endpoint (blend)	.06		.06		.06	.06⅛
NORTH LOUISIANA—						
58-60 437 endpoint (U. S. Motor)	.06¼	.06½	.06½		.06½	
ARKANSAS—						
58-60 437 endpoint (U. S. Motor)	.06¼	.06½	.06⅜	.06½	.06⅜	.06½
PENNSYLVANIA—						
52-54 Naphtha	.07⅝	.07½	.07⅞	.08	.08	.08¼
54-56 Naphtha	.08	.08¼	.08	.08¼	.08	.08¼
58-60 Gasoline	.08	.08¼	.08	.08¼	.08	.08¼
60 Gasoline	.08½	.08¾	.08¾	.09	.08¾	.09
62 Gasoline	.09⅛	.09¼	.09¼	.09⅝	.09¼	.09⅝
64 Gasoline	.09¼	.09½	.09½	.09¾	.09½	.09¾
CALIFORNIA—						
58-60 437 endpoint (U. S. Motor) domestic	.08½	.09	.08½	.09	.08½	.09
CHICAGO DISTRICT (Based on Group 3)—						
50-52 450 endpoint (Naphtha)	.06		.06		.06	
56-58 450 endpoint	.05⅞	.06	.06	.06⅛	.06	.06⅛
58-60 437 endpoint (U. S. Motor)	.06	.06¼	.06⅛	.06¼	.06⅛	.06¼
60-62 400 endpoint	.06⅝	.06¾	.06¾	.06⅞	.06¾	
64-66 375 endpoint	.07	.07¼	.07	.07¼	.06⅞	.07⅛
68-70 360 endpoint	.07⅜	.07½	.07½	.07⅝	.07⅜	.07½
64-66 437 endpoint (blend)	.06	.06¼	.06¼	.06½	.06⅜	.06½

NATURAL GASOLINE

	Oct. 18		Oct. 11		Oct. 4	
OKLAHOMA (Group 3)—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.06⅛	.06¼	.06	.06¼	.06	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.06	.06¼	.06	.06¼	.06	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¾		.05⅝	.05¾	.05½	.05⅝
Grade BB, 84-92, 375 e.p., rec. 85%	.05¾		.05⅝	.05¾	.05½	.05⅝
Grade C, 80-92, 375 e.p., rec. 78%	.05½	.05⅝	.05½	.05⅝	.05½	
NORTH TEXAS—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.06⅛	.06¼	.06	.06¼	.06	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.06		.06	.06¼	.06	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¾		.05⅝	.05¾	.05½	.05⅝
Grade BB, 84-92, 375 e.p., rec. 85%	.05¾		.05⅝		.05½	.05⅝
Grade C, 80-92, 375 e.p., rec. 78%	.05½	.05⅝	.05½	.05⅝	.05½	
NORTH LOUISIANA—						
Grade AA, 80-87, 375 e.p., rec. 90%	.06¼		.06¼		.06¼	
Grade BB, 84-92, 375 e.p., rec. 85%	.06		.05¾		.05¾	
Grade C, 80-92, 375 e.p., rec. 78%	.05¾		.06	.06¼	.06	.06¼
CALIFORNIA—						
75-85, 375, 390 endpoint	.08½	.09	.08½	.09	.08½	.09
CHICAGO DISTRICT (Based on Group 3)—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.06⅛	.06¼	.06	.06¼	.06	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.06		.06		.06	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¾		.05⅝	.05¾	.05⅝	
Grade BB, 84-92, 375 e.p., rec. 85%	.05¾		.05⅝	.05¾	.05⅝	
Grade C, 80-90, 375 e.p., rec. 78%	.05½	.05⅝	.05½	.05⅝	.05½	

Note: All natural gasoline except California is noncorrosive.

BURNING OIL

	Oct. 18		Oct. 11		Oct. 4	
KANSAS—						
41-43 water white Kerosene	.04¾	.05	.04½	.04¾	.04½	.04¾
OKLAHOMA (Group 3)—						
41-43 water white Kerosene	.04⅝	.04¾	.04½	.04¾	.04½	.04⅝
42-44 water white Kerosene	.04⅞	.05	.04¾	.04⅞	.04¾	
NORTH LOUISIANA—						
41-43 prime white Kerosene	.04¾		.04½	.04⅝	.04½	.04⅝
NORTH TEXAS—						
41-43 water white Kerosene	.04⅝		.04½		.04½	
40-42 water white Kerosene	.04⅜	.04½	.04¼	.04⅜	.04¼	.04⅜
ARKANSAS—						
41-43 water white Kerosene	.04½		.04¼	.04½	.04¼	.04½
PENNSYLVANIA—						
43 Kerosene prime white	.06¼	.06½	.06¼	.06½	.05⅞	.06⅛
45 Kerosene water white	.06¾	.07	.06⅝	.06⅞	.06	.06¼
46 Kerosene water white	.07¼	.07½	.07	.07¼	.06¼	.06½
47 Kerosene water white	.07½	.07⅝	.07¼	.07½	.06⅝	.07
300 Mineral Seal	.07¼	.07½	.07¼	.07½	.07	.07¼
CALIFORNIA—						
38-40 water white Kero. (high burning test)	.05	.05½	.05	.05½	.05	.05½
Engine distillate, 43-45 445 endpoint	.07¼	.08	.07¼	.08	.07½	.08½
Engine distillate, 42-44 480 endpoint	.07	.07¼	.07	.07¼	.07	.07½
CHICAGO DISTRICT (Based on Group 3)—						
41-43 water white Kerosene	.04½	.04⅝	.04⅜	.04½	.04⅜	.04½
42-44 water white Kerosene	.04⅞	.05	.04¾		.04¾	

FUEL OILS

	Oct. 18		Oct. 11		Oct. 4	
KANSAS—						
22-26 Fuel Oil	.85	.92½	.85	.92½	.85	.92½
18-22 Fuel Oil	.82½	.85	.82½	.85	.82½	.85
32-36 Gas Oil	.02⅝		.02⅝		.02⅝	
38-40 Distillate	.03¼	.03⅜	.03¼	.03⅜	.03¼	
OKLAHOMA (Group 3)—						
Below 18 Fuel Oil	.72½	.75	.72½	.75	.72½	.75
18-22 Fuel Oil	.77½	.80	.77½	.80	.77½	.80
22-26 Fuel Oil	.80	.82½	.80	.82½	.80	.82½
24-26 Fuel Oil	.82½	.85	.82½	.85	.82½	.85
26-30 Fuel Oil	.87½		.87½		.87½	
28-30 Fuel Oil	.92½	.95	.92½	.95	.92½	.95
32-36 Gas Oil (dark)	.02½		.02½		.02½	
32-36 Gas Oil (straw overhead)	.02⅝		.02⅝		.02⅝	
36-38 Distillate	.03	.03⅛	.03	.03⅛	.03	.03⅛
38-40 Straw Distillate	.03⅛	.03¼	.03⅛	.03¼	.03⅛	.03¼
NORTH TEXAS—						
24-26 Fuel Oil (sellers' cars)	.80	.82½	.80	.82½	.80	.82½
32-36 Gas Oil (straw)	.02¼	.02½	.02¼	.02½	.02¼	.02½
38-40 Straw Distillate	.03	.03⅜	.03	.03⅜	.03	.03⅜
NORTH LOUISIANA—						
18-20 Fuel Oil	1.05	1.10	1.07½	1.12½	1.07½	1.12½
32-36 Gas Oil	.02¾	.03	.02¾	.03	.02¾	.03
ARKANSAS—						
36-38 Distillate	.03¼	.03½	.03¼	.03½	.03¼	.03½
32-36 Gas Oil (straw)	.03¼		.03¼		.03¼	
16-20 Refinery Fuel Oil	1.00	1.05	1.00	1.05	1.00	1.05
GULF COAST (South Texas)—						
Gas Oil	.04		.04		.04	
Fuel Oil	1.60	1.65	1.60	1.65	1.60	1.65
PENNSYLVANIA—						
30-34 Fuel Oil	.04⅜	.04⅝	.04⅜	.04⅝	.04¼	.04½
36-40 Fuel Oil	.04⅞	.04⅞	.04⅝	.04⅞	.04½	.04¾
CALIFORNIA—						
33-36 Distillate	.03¾	.04	.03¾	.04	.03¾	.04
27-32 Distillate	.03¼	.03¾	.03¼	.03¾	.03¼	.03¾
*15-20 Fuel Oil, Bunkers (at tide water)	1.00		1.00		1.00	
15-20 Fuel Oil (cargo lots)	.90		.90		.90	
27 plus Diesel	1.15	1.19	1.15	1.19	1.15	1.19
CHICAGO DISTRICT (Based on Group 3)—						
24-26 Fuel Oil (sellers' cars) Group 3	.82½	.85	.82½	.85	.82½	.85
22-26 Fuel Oil (sellers' cars) Group 3	.80	.82½	.80	.82½	.80	.82½
18-22 (Group 3)	.77½	.80	.77½	.80	.77½	.80
16-20 Smackover	1.02½	1.05	1.05	1.07½	1.05	1.07½
32-36 Gas Oil (zero)	.02¾	.02⅞	.02¾	.02⅞	.02¾	.02⅞
32-36 Gas Oil (industrial)	.02⅝	.02¾	.02⅝	.02¾	.02½	.02⅝
36-38 Distillate	.03	.03⅛	.03	.03⅛	.03	
38-40 Straw Distillate	.03¼	.03⅜	.03⅛	.03¼	.03¼	.03¼

*Bunkers.

LUBRICATING OIL AND WAX

	Oct. 18		Oct. 11		Oct. 4	
OKLAHOMA (Group 3)—						
100 vis., 2 color, 20-25 cold test	.06¼	.06½	.06¼	.06½	.06¼	.06½
100 vis., 3 color, 20-25 cold test	.06	.06¼	.06	.06¼	.06	.06¼
150 vis., 3 color, 20-25 cold test	.08¼	.08½	.08¼	.08½	.08¼	.08½
150 vis., 4 color, 20-25 cold test	.08	.08¼	.08	.08¼	.08	.08¼
180 vis., 3 color, 23-28 cold test	.09¾	.10	.09¾	.10	.09¾	.10
180 vis., 4 color, 23-28 cold test	.09½	.09¾	.09½	.09¾	.09½	.09¾
180 vis., 5 color, 23-28 cold test	.09¼	.09½	.09¼	.09½	.09¼	.09½
200 vis., 3 color, 23-28 cold test	.10	.10½	.10	.10½	.10	.10½
200 vis., 4 color, 23-28 cold test	.10⅛	.10⅝	.10⅛	.10⅝	.10⅛	.10⅝
200 vis., 5 color, 23-28 cold test	.10¼	.10½	.10¼	.10½	.10¼	.10½
240 vis., 3 color, 25-30 cold test	.13¾	.14	.13¾	.14	.13¾	.14
240 vis., 4 color, 25-30 cold test	.13¼	.13½	.13¼	.13½	.13¼	.13½
240 vis., 5 color, 25-30 cold test	.12¼	.12½	.12¼	.12½	.12¼	.12½
280 vis., 3 color, 25-30 cold test	.15½	.16	.15½	.16	.15½	.16
280 vis., 4 color, 25-30 cold test	.15	.15½	.15	.15½	.15	.15½
280 vis., 5 color, 25-30 cold test	.14	.14½	.14	.14½	.14	.14½
Cylinder Stocks:						
600, steam refined, light green	.07	.09	.07	.09	.07	.09
600, steam refined, dark green	.05	.06	.05	.06	.05	.06
190-200 vis. @ 210 Bright Stock	.31	.33	.31	.33	.31	.33
150-160 vis. @ 210 Bright Stock	.25	.26	.26		.26	
Waxes:						
124-126 White Crude Scale Wax	.02¾		.02¾		.02¾	
PENNSYLVANIA—						
34 Neutral	.07½	.08	.07½	.08	.07½	.08
34 Sundebloom	.08¾	.09	.08¾	.09	.08¾	.09
36 Miners' Neutral	.07½	.07¾	.07½	.07¾	.07½	.07¾
150, 3 color	.27¼	.27¾	.27¼	.27¾	.27¼	.27¾
180, 3 color	.31	.31½	.31	.31½	.31	.31½
200, 3 color	.33¼	.33½	.33¼	.33½	.33¼	.33¾
220, 3 color	.36	.36½	.36	.36½	.36	.36½
600, steam refined	.10¼	.10¾	.10	.10½	.09½	.10
635, steam refined	.11	.11½	.11	.11½	.10½	.11
650, steam refined	.12½	.13	.12½	.13	.11½	.12
600, Pennsylvania flash	.17	.17½	.17	.17½	.15	.15½
*550, E filtered	.17¼	.18	.17¼	.18	.17¼	.18
*600, E filtered	.18½	.19	.18½	.19	.18½	.19
600, E filtered	.16½	.17	.16½	.17	.16½	.17
600, D filtered	.25½	.26	.25½	.26	.25½	.26
550, E filtered	.17½	.18	.17½	.18	.17½	.18
550, D filtered	.21½	.22	.21½	.22	.21½	.22
Pennsylvania Bright Stock	.31½	.32½	.32¼	.33¼	.33	.34
†122-124 White Crude Scale Wax	.03¼	.03⅜	.03	.03¼	.03	.03¼
†124-126 White Crude Scale Wax	.03⅛	.03⅜	.03	.03¼	.03	.03¼

*At Warren, Pa. †At New York City.

GULF COAST (South Texas)—						
No. 2 color, 100 vis., pale oil	.07	.07½	.07	.07½	.07	.07½
No. 3 color, 200 vis., pale oil	.09½	.10	.09½	.10	.09½	.10
No. 3 color, 300 vis., pale oil	.10½	.11½	.10½	.11½	.10½	.11½
No. 3½ color, 500 vis., pale oil	.12½	.13	.12½	.13	.12½	.13
No. 4 color, 750 vis., pale oil	.15½	.16	.15½	.16	.15½	.16
No. 5 to 6 color, 200 vis., red oil	.08	.08½	.08	.08½	.08	.08½
No. 5 to 6 color, 300 vis., red oil	.09½	.10	.09½	.10	.09½	.10
No. 5 to 6 color, 500 vis., red oil	.10½	.11	.10½	.11	.10½	.11
No. 5 to 6 color, 750 vis., red oil	.13½	.14	.13½	.14	.13½	.14
No. 2 color, 200 vis., pale filtered	.12¾	.14	.12¾	.14	.12¾	.14
No. 2 color, 300 vis., pale filtered	.14	.14½	.14	.14½	.14	.14½
No. 2½ color, 500 vis., pale filtered	.15½	.16½	.15½	.16½	.15½	.16½
No. 2½ color, 750 vis., pale filtered	.20	.20½	.20	.20½	.20	.20½
CALIFORNIA—						
130 vis., 2½-3 color	.09	.10	.09	.10	.09	.10
200 vis., 2½-3 color	.10	.10½	.10	.10½	.10	.10½

REFINERY AND CRUDE PRICES

Quotations on Principal Refined Products and Crude Petroleum Markets in All the American Oil Fields

300 vis., 3 -3½ color	.10½	.11	.10½	.11	.10½	.11
350 vis., 3½-4 color	.11	.12	.11	.12	.11	.12
400 vis., 3½-4 color	.13	.14	.13	.14	.13	.14
Red Neutral:						
200 vis., 4½-5 color	.08½	.09	.08½	.09	.08½	.09
300 vis., 5 -6 color	.09	.09½	.09	.09½	.09	.09½
400 vis., 5 -6 color	.11	.11½	.11	.11½	.11	.11½
500 vis., 4½-5 color	.11¼	.12	.11¼	.12	.11¼	.12
500 vis., 5 -6½ color	.11	.11½	.11	.11½	.11	.11½
600 vis., 6 plus color	.12	.12½	.12	.12½	.12	.12½

Note: Bright stocks are not manufactured commercially on the Pacific Coast.

NEW YORK (BAYONNE) REFINERY PRICES

	Oct. 18	Oct. 11	Oct. 4
Gasoline, U. S. Motor, 58-60 437	.08¼	.08¼	.08¼
Kerosene, water white, 41-43	.07½	.07½	.07½
*Fuel Oil, bunker "C," 14-16, per bbl.	1.55	1.55	1.55
*Fuel Oil, Diesel, 28-30, per bbl.	2.10	2.10	2.10
Gas Oil, 28 plus	.05½	.05½	.05½
25 pale Paraffin Oil	.12	.12	.12
28 pale Paraffin Oil	.07¼	.07¼	.07¼
285 red Paraffin Oil	.11½	.11½	.11½
250 red Paraffin Oil	.10½	.10½	.10½
225 red Paraffin Oil	.10	.10	.10
200 red Paraffin Oil	.09½	.09½	.09½
Refined Wax:			
120-122 a.m.p., per lb.	.04	.04	.04
125-127 a.m.p., per lb.	.04¼	.04¼	.04¼
130-132 a.m.p., per lb.	.05	.04¾	.04¾
135-137 a.m.p., per lb.	.05¾	.05¾	.05¾
Petrolatum, in bbls., carload lots, per lb.:			
Dark green	.01⅞	.01⅞	.01⅞
Amber	.03⅜	.03⅜	.03⅜
Extra amber	.03¾	.03¾	.03¾
Cream	.06	.05¾	.05¾
Lily white	.07½	.07⅜	.07⅜
Snow white	.08½	.08⅜	.08⅜

*Lighterage 6.5c a barrel extra.

NEW YORK (BAYONNE) EXPORT PRICES

	Oct. 18	Oct. 11	Oct. 4
Gasoline, U. S. Motor, 58-60 437, in cases	.2440	.2440	.2440
Kerosene, standard white, in cases	.1715	.1715	.1715
Kerosene, water white, in cases	.1815	.1815	.1815
600 steam refined cylinder stock, in bbls.	.17	.16½	.16½
635 steam refined	.19	.19	.19
650 steam refined	.20	.20	.20
600 Pennsylvania flash	.23	.23	.23
630 Pennsylvania flash	.35	.32	.32
600 Warren E	.25	.25	.25
600 Oil City E	.24	.24½	.24½
Light 135 Bright Stock	.40	.43	.43
Dark 135 Bright Stock	.38	.41	.41

LOS ANGELES EXPORT PRICES

	Oct. 18		Oct. 11		Oct. 4	
Kerosene, water white	.04¼	.04¾	.04¼	.04¾	.04¼	.04¾
U. S. Motor Gasoline, 53-55 437 e.p.	.06	.06½	.06	.06½	.06¼	.06¾

CALIFORNIA CRUDE PRICES

Standard Oil Co.-Union Oil Co. (Effective April 1, 1927)*

Gravity—	Fullerton, Seal Beach, Long Beach, Huntington Beach, Richfield, Rosecrans-Dom'guez, Torrance-Inglewood 1	Whittier, La Habra, Montebello 2	Kern River, Newhall-McKittrick, Midway-Sunset, Elk Hills, Lost Hills, Beiridge, Buena Vista Hills 3	Coyote 4	Santa Fe Springs 5	Coalinga 6	Wheeler Ridge 7	Santa Maria, Ventura, Orcutt, Salt Lake 8
14°	.85	.85	.75	.85	....	.75	.75	.85
15°	.85	.85	.75	.85	....	.75	.75	.85
16°	.85	.85	.75	.85	....	.75	.75	.85
17°	.85	.85	.75	.85	....	.75	.75	.85
18°	.85	.85	.75	.85	....	.75	.75	.85
19°	.85	.85	.75	.85	....	.75	.75	.85
20°	.85	.85	.77	.85	....	.76	.76	.85
21°	.86	.85	.79	.86	.85	.77	.77	.85
22°	.87	.85	.81	.87	.85	.78	.78	.85
23°	.88	.85	.83	.88	.85	.79	.79	.85
24°	.89	.85	.85	.89	.85	.80	.80	.85
25°	.90	.86	.87	.90	.86	.81	.81	.86
26°	.92	.87	.89	.91	.87	.82	.82	.87
27°	.94	.88	.91	.92	.88	.85	.83	.88
28°	.96	.89	.93	.92	.89	.87	....	.89
29°	.98	.90	.96	.94	.91	.89	....	.91
30°	1.00	.91	.99	.95	.93	.91	....	.93
31°	1.02	....	1.02	....	.95	.93	....	.95
32°	1.06	....	1.05	....	.97	.95	....	.97
33°	1.09	....	1.08	....	.99	.97	....	.99
34°	1.12	....	1.11	....	1.01	.99	....	1.01
35°	1.15	....	....	....	1.03	1.01	....	1.03
36°	1.18	....	....	....	1.06	....	....	1.06*
37°	1.21	....	....	....	1.09	....	....	1.09
38°	1.24	....	....	....	1.12	....	....	1.12
39°	1.27	....	....	....	1.15	....	....	1.15
40°	1.30	....	....	....	....	....	....	....
41°	1.33	....	....	....	....	....	....	....
42°	1.36	....	....	....	....	....	....	....

*Column 1—Long Beach, Seal Beach and Huntington Beach crudes, 14 to 32 degrees, inclusive; Richfield and Fullerton, 14 to 30 degrees; Torrance and Inglewood, 14 to 28 degrees; Dominguez, 24 to 42 degrees. Rosecrans crude ranges from 14 to 42 degrees, but only Union Oil Co. posts below 24 degrees.

Column 2—Whittier crude, 14 to 22 degrees; Montebello, 14 to 20 degrees.

Column 3—Kern River, Newhall and McKittrick, 14 to 19 degrees; Midway-Sunset, Buena Vista and Elk Hills, 14 to 33 degrees; Lost Hills and Beiridge, 14 to 34 degrees.

Column 8—Salt Lake, 14 to 19 degrees, inclusive; Santa Maria, 14 to 30 degrees, Ventura and Orcutt, 14 to 39 degrees. Posted only by Union Oil Co.

CRUDE OIL GRAVITY PRICE TABLE

Gravity—	Okla., Kans., N. C. Tex., La.-Ark. 1	Smackover, Ark. 2	Stephens, Ark. 3	Gray County (Texas Panhandle) 4	Crane, Upton, Pecos, Crockett Counties (West Texas) 5	Salt Creek, Wyo. 6	Grade B & Light Crude (G. Coast) 7	Somerset (South Central Texas) 8
Below 24	....	.90	....	....	....	....	....	....
24 and above	....	1.15	....	....	....	....	....	....
Below 25	....	....	....	....	....	....	1.15	....
25 to 25.9	....	....	....	....	....	....	1.17	....
Below 26	....	....	....	....	.80	....	....	....
26 to 26.9	....	....	....	....	.80	....	1.19	....
27 to 27.9	....	....	....	....	.80	....	1.21	....
Below 28	(•)	....	1.00	....	....	....	....	....
28 to 28.9	1.12	....	1.02	.80	.60	....	1.23	....
29 to 29.9	1.14	....	1.04	.82	.60	1.14	1.25	....
30 to 30.9	1.16	....	1.06	.84	.60	1.16	1.27	....
31 to 31.9	1.18	....	1.08	.86	.60	1.18	1.29	....
32 to 32.9	1.20	....	1.10	.88	.60	1.20	1.31	1.05
33 to 33.9	1.22	....	....	.90	.60	1.22	1.33	1.07
34 to 34.9	1.24	....	....	.92	.60	1.24	1.35	1.09
35 to 35.9	1.26	....	....	.94	.60	1.26	1.37	1.11
36 to 36.9	1.28	....	....	.96	.60	1.28	....	1.13
37 to 37.9	1.30	....	....	.98	....	1.30	....	1.15
38 to 38.9	1.32	....	....	1.00	....	....	....	1.17
39 to 39.9	1.34	....	....	1.02	....	....	....	....
40 to 40.9	1.36	....	....	1.04	....	....	....	....
41 to 41.9	1.38	....	....	1.06	....	....	....	....
42 to 42.9	1.40	....	....	1.08	....	....	....	....
43 to 43.9	1.42	....	....	1.10	....	....	....	....
44 to 44.9	1.44	....	....	1.12	....	....	....	....
45 to 45.9	1.46	....	....	....	....	....	....	....
46 to 46.9	1.48	....	....	....	....	....	....	....
47 to 47.9	1.50	....	....	....	....	....	....	....
48 to 48.9	1.52	....	....	....	....	....	....	....
49 to 49.9	1.54	....	....	....	....	....	....	....
50 to 50.9	1.56	....	....	....	....	....	....	....
51 to 51.9	1.58	....	....	....	....	....	....	....
52 and above	1.60	....	....	....	....	....	....	....

Column 1—Magnolia Petroleum Co. posted new schedule September 14, making price below 30 gravity $1.05 per barrel, with 2 cents increase per degree higher in gravity, taking 30-30.9 gravity at $1.16 as basis, with a top price of $1.60 for 52 and above.

Oklahoma: Prairie Oil & Gas Co., Sinclair Oil & Gas Co., Gypsy Oil Co., March 13; Carter Oil Co., The Texas Company, March 14.

North Central Texas—[including Ranger, Mexia, Powell, Richland, Wortham, Lytton Springs (Southwest Texas), Iatan and Panola (Magnolia only), Currie, Nocona, Moran and Corsicana light]: Texas, Prairie, Sinclair and Gulf, March 12; The Texas Company, Humble Oil & Refining Co., March 14.

Kansas—Prairie, Sinclair, March 12; Carter, Texas, March 14.

Arkansas and North Louisiana—[Caddo, Bull Bayou, Crichton, De Soto, Haynesville, Homer and El Dorado only]: Standard Oil Co. of Louisiana, March 14; The Texas Company, March 14; Magnolia Petroleum Co., Pine Island, Haynesville and Bull Bayou, El Dorado, Gulf Pipe Line Co., March 14.

Column 2—On September 17, Louisiana Oil & Refining Co. On September 20, Standard Oil Co. of Louisiana, Magnolia Petroleum Co., Gulf Refining Co., and Atlantic Producing Co. September 23, The Texas Company.

Column 3—Atlantic Oil Producing Co., March 14.

Column 4—Humble Oil & Refining Co. and Gulf Pipe Line Co., March 14. On August 23 Magnolia Petroleum Co. posted flat 75 cents.

Column 5—Humble Oil & Refining Co., August 23; Kay County Gas Co., Magnolia Petroleum Co., and Gulf Pipe Line Co., August 24.

Column 6—Midwest Refining Co., March 13. All crude over 37 gravity, $1.30 per barrel.

Column 7—Humble Oil & Refining Co. and other major buyers (schedule ends "35 and above"), March 14, with exception of Magnolia Petroleum Co., which stops at 31 degrees gravity. Sun Pipe Line Co. posts 2 cents differential for each degree above 35 gravity and $1.47 for 40 gravity and above.

Column 8—Grayburg Pipe Line Co. and Pioneer Oil & Refining Co., April 7.

•Prices for crude below 28 gravity; Oklahoma, Kansas and Texas, Magnolia Petroleum Co., $1.10, March 12; Arkansas, North Louisiana, March 14. Other companies, 2 cents less for each degree, with exception of Humble Oil & Refining Co., which pays $1.12 for crude below 28 degrees gravity.

CRUDE OIL PRICES

OKLAHOMA, KANSAS, NORTH AND EAST CENTRAL TEXAS

*Corsicana heavy (March 14, 1927)	$1.00
Other fields	See gravity table

*Posted by Magnolia Petroleum Co.

TEXAS PANHANDLE

*Carson County	$ .75
*Hutchinson County	.75
*Wheeler County	.75
Gray County	See gravity table

*Humble Oil & Refining Co.
Magnolia Petroleum Co., Gulf Pipe Line Co., and Kay County Gas Co., August 23.

WEST TEXAS

*Iatan (same as North Texas).	
Crane-Upton-Crockett	See gravity table

*Includes Howard County and Westbrook Fields. Kay County Gas Co. pays $1.05 for Howard County crude, effective May 21.

ARKANSAS-NORTH LOUISIANA

Cotton Valley (March 17)	$1.00
Bellevue (Feb. 24, 1927)	1.25
Urania (Sept. 15, 1927)	.90
East El Dorado (Sept. 20)	.90
Other fields	See gravity table

Note—Cotton Valley and Bellevue, Standard Oil Co. of Louisiana, Gulf Refining Co. and Magnolia Petroleum Co.; Urania, Louisiana Oil Refining Corp.; East El Dorado, Magnolia Petroleum Co., Gulf Refining Co.

GULF COAST

(Goose Creek, Hull, Liberty, West Columbia, Orange, Boling, Sour Lake, Humble, High Island, Pierce Junction and Spindletop.)

‡Grade A (March 14)	$1.20
Grade B	See gravity table
•Jennings, La. (March 14)	1.05
†Saratoga, Batson, Dayton (March 14, 1927)	1.30
‡Markham (March 14)	1.00

•Gulf Pipe Line Co. †Sun Pipe Line Co. ‡Humble Oil & Refining Co. and other major buyers. §The Texas Company.

SOUTH CENTRAL AND SOUTHWESTERN TEXAS

•Luling (May 5)	$1.00
†Mirando (March 14)	1.00
Rockdale-Minerva (April 15):	
38-38.9 gravity	1.27
39-39.9 gravity	1.29
40 and above	1.31
•Thrall	....
Callihan (May 15)	1.75
Lytton Springs (Lockhart)	See gravity table
Somerset	See gravity table

•Posted by Magnolia Petroleum Co. Thrall prices same as north central Texas less 19¼ cents per cwt. freight.

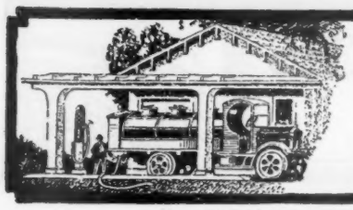
†Magnolia Petroleum Co., Humble Oil & Refining Co., Crown Central Pipe Line Co.

ROCKY MOUNTAIN STATES

Ohio Oil Co.-Midwest Refining Co.
(Effective March 14)

Rock Creek, Wyo. (March 12)	$1.35
Salt Creek	See gravity table
Big Muddy (March 12)	1.25
Mule Creek (May 1)	1.10
Grass Creek, heavy	.90
Grass Creek, light	1.33
Elk Basin (March 12)	1.28
Lance Creek (March 12)	1.33
Poison Spider	1.00
Notches	.65
Rex Lake (February 22)	1.10
Osage	1.33
Lost Soldier (contract)	.95
Greybull-Torchlight	1.33
Hamilton Dome	.85
Cat Creek (Mont.)	1.33
Sunburst (Mont.)	1.35

(Continued on Page 166)



TANK WAGON MARKETS

Tank wagon quotations for gasoline and kerosene in United States as furnished by the larger marketing concerns Oct. 18.

ALL TANK WAGON AND SERVICE STATION QUOTATIONS INCLUDE TAXES

STANDARD OIL CO. (INDIANA)

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
Chicago dist. ..	16 0	18 0	2 0	12 0
Decatur, Ill. ..	10 5	12 5	2 0	13 1
E. St. Louis ...	15 1	17 35	2 0	11.2
Joliet	16.4	18.4	2 0	12 3
Peoria	13.2	13.2	2.0	12.1
Quincy	16 2	18 2	2 0	11.9
Davenport, Ia..	15.5	17.5	3.0	12.3
Des Moines ...	13.9	15 9	3.0	12 3
Keokuk	17 5	19 5	3 0	12.3
Sioux City	17 1	19.1	3 0	11 9
Duluth, Minn...	15 5	17 5	2 0	12.9
Minneapolis	14 0	14 0	2 0	12 9
Mankato	17.1	19 1	2 0	13 7
LaCrosse, Wis. .	17 3	19 2	2.0	13 0
Milwaukee	16.1	18 1	2 0	11 9
Madison	16 3	18 3	2 0	13 1
Detroit, Mich. .	15.8	17.8	3.0	12.7
Grand Rapids .	14 0	16 0	3 0	13 6
Saginaw	17 9	19.9	3 0	13 8
Evansville, Ind.	17 0	19.0	3 0	13 0
Ft. Wayne	14 0	14.0	3 0	13 4
Indianapolis ..	14.2	15.2	3.0	12.2
South Bend ...	15 0	15 0	3 0	13 4
Fargo, N. D. ..	17 0	19.0	2 0	14 9
Huron, S. D. ..	19 5	21.5	4 0	13 9
Sioux Falls ...	15 0	17.0	4 0	13 4
*K. C., Mo. ..	14 9	16.9	3 0	10.6
*Springfield ..	16 8	18 8	3 0	11.5
*St. Louis	15 6	17 9	2 5	11.3
*St. Joseph ...	14 5	16 5	3 0	11.3
Wichita, Kans.	14 8	16.8	2 0	10 8
Bartlesville, Ok.	15.8	17 8	3.0	10.8

NAPHTHAS

	Tank wagon	Tank car
Oleum spirits	16.0	10 75
V. M. & P. naphtha	18.0	12 75
Cleaner's naphtha	18 0	13 75
Stanisol	19.0	14 75

Tank wagon prices f.o.b. Chicago; tank car prices f.o.b. Whiting.

STANDOLIND FURNACE OIL

Less than 100 gallons	9 0
100 to 799 gallons	8 0
800 or more gallons	7.5

Tank wagon prices of gasoline subject to discount of 1 cent a gallon on dumps of 50 gallons or more throughout territory except Chicago district where discount applies only to dumps of 100 gallons. Kerosene subject to 1 cent discount on dumps of 50 gallons or more.

Outside the Chicago district, the following quantity discount schedule is in effect on monthly tank wagon deliveries of gasoline: 6,000 gallons or more, 1¼ cents; 10,000 gallons or more, 2 cents; 15,000 gallons or more, 3 cents. These discounts include the 1 cent allowed on dumps of 50 gallons or more at one delivery.

Within the Chicago district, the following quantity discount schedule is in effect on tank wagon deliveries of gasoline: 750 to 2,000 gallons, one-half cent; 2,000 to 3,000 gallons, three-fourths cent; 3,000 to 6,000 gallons, 1 cent; 6,000 to 10,000 gallons, 1½ cents; 10,000 to 15,000 gallons, 2 cents; 15,000 gallons or more, 3 cents. These discounts are in addition to the special discount of 1 cent on dumps of 100 gallons or more at one delivery.

If the quantity bought during the year is equal to or exceeds 12 times the agreed monthly quantity, the discount is paid or credited on the entire quantity at the close of the term less the monthly payments made during the year.

*State tax 3 cents; remainder city tax.

OHIO

Standard Oil Co. (Ohio)

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
All Ohio points	17 0	19 0	3.0	14.5

SOUTHWESTERN DISTRICT

Magnolia Petroleum Co.*

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
Dallas, Tex. ...	14 0	17 0	3 0	11.0
Fort Worth ...	14 0	16 0	3.0	10 0
Houston	13.0	15.0	3.0	15.0
San Antonio ..	13.0	15.0	3.0	10.0
El Paso	15.0	17.0	3.0	16.0
Texarkana ...	15 0	18.0	3 0	12.0
Muskogee, Ok. .	15 0	18 0	3 0	9 0
Okla. City	13.0	14.0	3.0	9.0
Tulsa	13.0	16.0	3.0	9.0
Ft. Smith, Ark.	14.0	17.0	3.0	12.0
Little Rock ...	16.0	18.0	5.0	12.0

*The following is the schedule of discounts on quantity gasoline sales adopted by the Magnolia Petroleum Co. in Oklahoma: Over 750 gallons a month, one-half cent; over 2,000 gallons, three-quarters cent; over 3,000 gallons, 1 cent; over 4,500 gallons, 1¼ cents; over 6,000 gallons, 1½ cents; over 8,000 gallons, 1¾ cents; over 10,000 gallons, 2 cents. If the quantity bought during the year is 12 times the monthly agreed purchases, the discount will be paid or credited on the entire quantity for the year less any monthly purchases.

The schedule on service station deliveries is: Over 200 gallons a month, 1 cent; over 300 gallons a month, 1¼ cents; over 400 gallons, 1½ cents; over 500 gallons a month, 1¾ cents; over 600 gallons, 2 cents. The same rule applies for annual purchases in the tank wagon discounts.

CENTRAL SOUTH DISTRICT

Standard Oil Co. (Louisiana)

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
*N. Orleans, La.	13.5	13.5	3.0	14.0
Baton Rouge ..	14.0	17.0	3.0	12.5
Alexandria	15.0	18.0	3.0	14.0
LaFayette	16.0	18.0	3.0	13.5
Lake Charles ..	15 5	18 5	3 0	14 0
Shreveport	15.5	18.5	3.0	13.0
Kn'xville, T'nn.	19.5	22.5	3.0	15 0
Memphis	16.5	16.5	3.0	14.0
Chattanooga ..	19.5	22.5	3.0	15.0
Nashville	18.0	21.0	3.0	15.0
Bristol	19.0	22.0	3.0	14.0
Lit. Rock, Ark	16.0	16.0	5.0	12.0

*Tax of 3 cents includes city tax of 1 cent.
*Louisiana kerosene prices include 1-cent state tax and 1-cent parish tax.

SOUTHERN DISTRICT

Standard Oil Co. (Kentucky)

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
Atlanta, Ga. ...	16.0	18.0	4.0	15.5
Augusta	19.0	22.0	4.0	16.5
Macon	19.0	22.0	4.0	16.5
Savannah	16.0	18.0	4.0	14.5
Birm'h'm, Ala..	18.0	21.0	4.0	15.5
Mobile	17.0	20.0	4.0	15.0
Montgomery ...	19.0	22.0	5.0	16.5
Clarks'le, Miss..	17.0	20.0	4.0	13.5
Jackson	17.0	20.0	4.0	13.5
Natchez	16.5	19.5	4.0	14.0
Gulfport	18.5	21.5	6.0	14.0
Vicksburg	16.5	19.5	4.0	14.0
Jack'ville, Fla..	18 0	21.0	5.0	14 0
Miami	20 0	23.0	5 0	15.5
Pensacola	19 0	22 0	5 0	15 0
Tampa	17 0	20 0	5.0	14 0
Lexington, Ky..	18.0	21.0	5.0	15.5
Covington, Ky..	19.0	22.0	5.0	15.5
Louisville	19.0	22.0	5.0	15.0

In addition to the state tax of 3 cents on gasoline, Montgomery has city tax of 1 cent on gasoline. Kerosene prices in Georgia includes 1 cent tax. In Florida, an inspection fee of 0.125 cent; in Alabama, an inspection fee of one-half cent on kerosene only. Pensacola tax includes 1 cent city levy. Gulfport tax includes privilege tax of 3 cents in addition to state tax.

PENNSYLVANIA-DELAWARE AND PART NEW ENGLAND

Atlantic Refining Co.

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
Pittsburgh, Pa..	16.0	*22.0	...	14.0
Philadelphia ..	14.0	17.0	...	14.0
Scranton	16.0	*22.0	...	14.0
Allentown	16.0	*22.0	...	14.0
Altoona	16.0	*22.0	...	14 0
Erie	14.0	*18.0	...	14.0
Dover, Del. ...	19.0	22.0	3.0	14.0
Wilmington ...	19.0	22.0	3.0	14.0
Spring'd, Mass.	17.0	17.0	...	16.0
Worchester	17.0	17.0	...	16.0
Boston	17.0	17.0	...	15.0
Providence, R.I.	19.0	19.0	3.0	15.0
Hartford, Conn.	21.0	22.0	3.0	15.0
New Haven	21.0	22.0	3.0	15.0

*Includes tax of 3.0 cents. Pennsylvania tax is collected by the dealer and paid by him direct to the state.

NEW YORK AND PART OF NEW ENGLAND DISTRICT

Standard Oil Co. (New York)

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
Albany, N. Y. ..	17.0	19.0	...	15.0
*New York	17.0	19.0	...	15.0
Buffalo	17.0	19.0	...	14.0
Rochester	18.0	18.0	...	14.0
Syracuse	17.0	19.0	...	15.0
Boston, Mass. .	17.0	19.0	...	15.0
Augusta, Me. ...	20.0	22.0	3.0	15.0
M'nch't'r, N.H..	18.0	22.0	3.0	15.0
Burlington, Vt..	20.0	22.0	3.0	15.0

*Price in steel barrels.

PACIFIC COAST DISTRICT

Standard Oil Co. (California)

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
San Francisco .	17.0	21.0	3.0	15.5
Pueblo	18.0	18.0	3.0	15.5
Los Angeles ...	16.5	20.5	3.0	15.5
Reno, Nev. ...	22.0	26.0	4.0	19.0
Portland, Ore. .	17.5	21.5	3.0	16.5
Seattle, Wash..	16.5	20.5	3.0	16.5
Tacoma	16.5	20.5	3.0	16.5
Spokane	20.5	24.5	3.0	20.5
Phoenix, Ariz..	22.0	26.0	3.0	20.5

ATLANTIC COAST DISTRICT

Standard Oil Co. (New Jersey)

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
Atlantic City ..	18.0	20.0	2.0	14.0
Newark, N. J. .	18.0	20.0	2.0	14.0
Annapolis, Md..	20.0	23.0	4.0	12.0
Balt more	20.0	23.0	4.0	10.0
Cumberland	20.0	23.0	4.0	14.0
Washington	18.0	21.0	2.0	13.0
Danville, Va. ...	20.5		4.5	14.0
Norfolk	20 5	23.5	4 5	12 0
Petersburg	20.5	23.5	4.5	14.0
Roanoke	20 5	23 5	4 5	14 0
Richmond	18.5	21.5	4.5	14.0
Ch'rist'n, W.Va.	20.0	23.0	4.0	14.0
Keyser	20.0	....	4.0	14.0
Parkersburg ..	17.0	20.0	4.0	14.0
Wheeling	20.0	23.0	4.0	14.0
Charlotte, N. C.	20.0	23.0	4.0	14.0
Hickory	20.0	23.0	4.0	14.0
Mt. Airy	20.0	23.0	4.0	14.0
Salisbury	20.0	23.0	4.0	14.0
Charl'stn, S. C.	20.0	23.0	5.0	14.0
Columbia	20.0	20.0	5.0	14.0

NEBRASKA

Standard Oil Co. (Nebraska)

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
Omaha	14.25	16.25	2.0	12.25
McCook	14.75	14.75	2.0	11.50
Norfolk	16 75	18 75	2 0	12 75
N. Platte	17.75	19.75	2.0	13.50
Scottsbluff	17.25	19.25	2.0	13.00

ROCKY MOUNTAIN DISTRICT

Continental Oil Co.

	Gasoline Tank wag'n	Gasoline Service station	Gasoline Incids tax of	Kero. Tank wag'n
Denver, Colo...	16.0	16.0	3.0	12.5
Pueblo	16 0	16.0	3.0	14.5
Grand Jnctn. ..	20.5	22 5	3.0	18 0
Casper, Wyo. ..	17.0	19 0	3 0	13 0
Cheyenne	18.0	20.0	3.0	14.5
Butte, Mont. ..	22.0	22.0	3.0	19 0
Helena	22.5	24.5	3.0	19 0
Salt Lake, Utah	21.0	23.0	3.5	17.0
Boise, Idaho .	23.5	25.5	4.0	19.0
Twin Falls ...	23.5	25.5	4.0	19 0
Albu'que, N. M.	21.0	24.0	5.0	17.0

TANK WAGON CHANGES

August 5.—Standard Oil Co. of Louisiana reduced the gasoline station price 1½ cents in Memphis, Tenn., making the new price 16.5 cents.

August 31.—Standard Oil Co. reduced the gasoline tank wagon and station prices 2 cents and 3 cents, respectively, at Little Rock, Ark., making the new prices 16 cents and 18 cents.

October 8.—Continental Oil Co. reduced the gasoline station price 1 cent at Pueblo, Colo., making the new price 18 cents.

October 10.—Continental Oil Co. reduced the gasoline station price 1 cent at Pueblo, Colo., making the new price 17 cents.

October 11.—Standard Oil Co. of Louisiana decreased the gasoline tank wagon price 1½ cents at Memphis, making the new price 16.5 cents.

October 12.—Standard Oil Co. of Louisiana decreased the gasoline tank wagon 1 cent at Indianapolis, Ind., making the new price 14.2 cents.

October 13.—Standard Oil Co. of Louisiana decreased the gasoline station price 2 cents at Little Rock, Ark., making the new price 16 cents.

October 14.—Continental Oil Co. decreased the gasoline tank wagon and station prices to 16 cents at Pueblo, Colo.

CALIFORNIA GASOLINE WEAK, EXPORTS HEAVY

LOS ANGELES, Calif., Oct. 15.—The California gasoline market continues to show evidence of nervousness. Keen competition has developed, especially for sales out of the State and prices have weakened somewhat. While two weeks ago gasoline sold in this trade was bringing around 7¼ cents f.o.b. Los Angeles, isolated sales have been reported during the past week as low as 6½ cents. In the main, however, these are distress sales and do not reflect the true status of the market.

The so-called "bootleg" situation in southern California is being closely watched by all the oil companies. Marketers are of the opinion that the ability of this cut rate gasoline to maintain present prices is the most important factor in preventing a reduction in gasoline prices by the larger companies. At present one or two of the smaller refiners are experiencing trouble in moving their gasoline and some distress loads are being offered below market. If this material is readily absorbed no serious consequences will be felt. However, the situation is causing marketers anxiety at this time.

With the start of colder weather, refiners are beginning to use more natural gasoline so as to market a quicker starting product. The result is that the demand for natural gasoline has been better during the past week than for many months. Along with the better demand prices have strengthened fractionally and very little if any can be purchased any longer at under 8¾ cents per gallon. Natural gasoline marketers are beginning to believe that the worst is over and that there are better times ahead.

Exports to the Atlantic Seaboard were very much heavier during the past week than during the week previous. A total amount of 676 841 bbls. were shipped which included 265,035 bbls. of fuel oil, 248,518 bbls. of gasoline, 84,875 bbls. of crude and 78,413 bbls. of gas oil. Shipments in the Atlantic foreign trade were even heavier totaling 725,695 bbls. This was made up of 577,402 bbls. of fuel oil and 148,293 bbls. of gasoline.

Fuel oil especially, has been moving out of the Los Angeles harbor in large volumes and this market at present is showing more strength than it has for some time. The reduction of tanker rates has been a very important factor in maintaining shipments from California at their high level.

CRUDE OIL PRICES

(Continued from Page 165)

Artesia (March 12)	1.00
Hogback (N. Mex.) (March 14)	1.35

Note: Salt Creek, Osage, Cat Creek, Greybull and Hogback posted by Midwest Refining Co., and the remainder by the Ohio Oil Co. Both companies post Grass Creek light and Elk Basin.

EASTERN STATES

Joseph Seep Purchasing Agency
(Effective August 1)

Penna Grade Oil in New York Transit Line (New York)	$2.65
Bradford District Oil in National Transit Lines (Pennsylvania)	2.65
Penna Grade Oil in National Transit Lines (Pennsylvania)	2.55
Penna Grade Oil in Southwest Pennsylvania Lines (West Virginia)	2.55
Penna Grade Oil in Eureka Pipe Line lines (Pennsylvania)	2.50
Penna Grade Oil in Buckeye Pipe Line lines (Ohio) (August 23)	2.35
Cabell Grade Oil in Eureka Pipe Line lines (West Virginia) (March 16) ...	1.40
Corning 35-cent grade oil in Buckeye Pipe Line Co.'s line (March 17)	1.35
Corning 25-cent grade oil in Buckeye Pipe Line Co.'s lines (March 17) ...	1.45
Somerset Oil in Cumberland Pipe Line lines (Kentucky) (March 16)	1.50
Ragland Grade Oil in Cumberland Pipe Line lines (Kentucky)	.95
Keister (Pennsylvania)	1.10

MIDDLE WESTERN STATES

Ohio Oil Co.
(Effective March 14)

Lima	$1.71
Wooster	1.57
**Saginaw, Mich., Saginaw Sand (May 27)	2.05
Illinois	1.60
Indiana	1.48
Princeton	1.60
Plymouth	1.38
Waterloo (Nov. 17, 1926)	1.35
*Western Kentucky	1.38
**Saginaw, Mich., Berea Sand (May 27)	1.95
†Cumberland, Barren, Clinton and Monroe Counties, Kentucky (March 16)..	1.50
‡Oil in lines of Stoll Oil Refining Co. in Oil City, Ky. (March 16, 1927)	1.50
†Clay County, Tennessee (Nov. 18) ...	2.35
‡Oil Springs (Canada)	2.18
‡Petrolia (Canada)	2.13

*Posted by Ohio Oil Co.
†Posted by Paragon Development Co.
‡Posted by Stoll Oil Refining Co.
‡Posted by Imperial Oil Co., Ltd.
**Posted by Sun Oil Co.

MEXICAN CRUDE

Note—Due to the fact that the exportation of Tuxpam light crude oil has become a negligible factor, prices will no longer be published.

*Panuco heavy (f.o.b. Mex. ports)	$1.15

*17.496 cents tax.

This Sign brings the motorist in!

and the Sinclair method of recommending Opaline brings him back!

Authorized Dealer

SINCLAIR OPALINE MOTOR OIL

REG. U. S. PAT. OFF.

Seals Power at every Degree of Wear

DISPLAY this sign outside your station—you tell your motoring world that you sell not just oil but *CORRECT LUBRICATION!* If you are an Authorized Opaline Dealer, you will ask a motorist to look at his speedometer and tell you how many miles his car has been driven, then you will consult the Sinclair Recommendation Index, and give him the right grade of Opaline to fit the degree of wear in his engine and seal its power!

That is the Sinclair Law of Lubrication in operation. That's the commonsense method of correct lubrication which brings the motorist in—and brings him back. Let us tell you how we co-operate with Authorized Opaline Dealers in building profitable business.

SINCLAIR REFINING COMPANY, INC.
Also Makers of Sinclair Gasoline and H-C Gasoline
45 NASSAU STREET, NEW YORK
Atlanta Boston Chicago Houston Kansas City

Entire contents copyrighted 1927 by Sinclair Refining Company, Inc.

Oil Securities Just Holding Their Own

Many Issues Drop to New Lows for Year but Average Maintained Around Last Week's Quotation Level

In the course of a general market marked by selling orders oil securities on Monday just about held their own, gauged by the quotations on the 20 representative issues used as a barometer in The Oil and Gas Journal's tabulation. Many new lows for the year were recorded.

Prairie Passes Dividend

The board of directors of the Prairie Oil & Gas Co. voted to pass the October dividend on the stock of the company. The officials made no formal announcement except to say that this action was taken to conserve cash. The Prairie has been buying and storing large quantities of Mid-Continent crude oil during the overproduction period since the Seminole Field was opened up last year and now has under construction several million barrels of steel storage in Seminole and other fields.

Independent Oil & Gas

The Independent Oil & Gas Co. reports for the quarter ended September 30, 1927, net income of $884,801 after depreciation, depletion, taxes, etc., equivalent to $1.77 a share on the 500,000 no par value capital shares outstanding. This compares with $324,604 or 65 cents a share in the preceding quarter and with $830,968 or $1.66 a share in the same quarter of 1926. The third quarter earnings before reserves amounted to $1,760,682, against $968,684 in the second quarter of 1926 and with $1,369,136 in the third quarter of 1926.

Net income for the nine months ended September 30 totaled $1,843,935 after reserves, or $3.68 a share, as against $1,760,397, or $3.52 a share in the corresponding period of 1926.

Average daily production during the third quarter amounted to 17,390 bbls., compared with 10,730 bbls. in the previous quarter and 7,903 bbls. in the third quarter of last year. The average sales price in the September quarter totaled $1.24 a barrel, against $1.22 a barrel in the previous quarter and $2.49 a barrel in the September quarter of 1926.

Pan American Petroleum

The Pan American Western Petroleum Co. and Pan American Petroleum & Transport Co. were victorious in the final action which terminates government suits to cancel the Elk Hills naval reserve oil leases and Pearl Harbor contracts. Federal Judge Paul McCormick ruled that the Government should receive no interest on the amount of money the defendant companies were ordered to pay in final decrees handed down May 10, 1927. In that decree, the two companies were ordered to pay, and since have paid, more than $13,000,000 based on the cancellation of leases.

Phillips Petroleum

A director of the Phillips Petroleum Co. states that the company has approximately $10,000,000 in cash and call loans and does not owe a dollar. It is taking in more cash than it is paying out and has additional current assets of $20,000,000. Furthermore, all interest accrued on the $40,000,000 of bonds issued is and has been charged against operating expenses since they were issued, and the sinking fund does not begin to operate until December, 1928. The company, he says, has in its treasury $1,000,000 of these bonds to take care of such fund to July, 1929.

"As between additional storage, which would mean a temporary frozen investment and a refinery, the management has chosen the latter," he further stated in reference to the recently announced plans for a new refinery in the Panhandle. "This will turn production profitably into cash, making further storage unnecessary. The cash outlay required for building the refinery stills in the Panhandle will be small on account of the company's other activities in that district. They have all the major facilities necessary for a refinery, including pipe lines, tank cars, tankage and fuel."

Union Oil of California

Sales of the Union Oil Co. of California for the nine months ended September 30, 1927, approximately $59,350,000, or $1,550,000 less than in the same period of 1926. A larger quantity of products was sold but at lower net sales value. Current assets at the end of the 1927 period totaled $55,000,000. Ratio of current assets to current liabilities were about six to one.

Indian Refining

The Indian Refining Co. and subsidiaries report for the six months ended June 30, 1927, showed net profit of $20,642 after interest, depreciation, etc., equivalent to 89 cents a share earned on $2,296,400 7 per cent stock. This compares with $307,864, or $13.40 a share, on the preferred and after allowing for the regular preferred dividend requirements to 28 cents a share on 785,068 shares of $10 par common stock in the first half of 1926. Accumulated dividends on the preferred stock amount to 38½ per cent on July 1, 1927.

The consolidated income account for the six months ended June 30, 1927, compares as follows:

	1927	1926
Net sales	$9,667,060	$11,619,734
Costs and expenses	9,209,564	11,099,753
Operating profit	$ 457,496	$ 519,981
Other income	61,096	176,912
Total income	$ 518,592	$ 687,893
Interest, etc.	497,950	380,029
Net profit	$ 20,642	$ 307,864

The consolidated balance sheet of the Indian Refining Co. and subsidiaries as of June 30, 1927, compares as follows:

Assets

	1927	1926
*Refin., tank cars, etc.	$14,295,174	$14,376,610
Trade marks	850,000	850,000
Cash	498,430	508,859
Accts. and notes receivable	1,686,632	1,696,764
Advances to agents, etc.	51,637	.....
Inventories	2,310,540	2,614,517
Prepaid oper. expenses	.....	270,065
Securities owned	13,561	15,602
Special deposits	66,653	.....
Sinking fund dep.	64,142	222,413
Deferred charges	544,496	136,804
Total	$20,381,265	$20,691,634

Liabilities

7% preferred stock	$2,296,400	$2,296,400
Common stock	†7,850,680	7,850,680
Funded debt	1,380,000	1,902,000
Bank loans	1,250,000	1,000,000
Accounts payable	2,298,396	2,432,343
Other cur. liabilities	.....	248,351
Accrued int. app. to sk. fund	42,216	56,293
Reserves	27,250	787,342
Purchase contig.	449,459	246,466
Surplus	4,786,864	3,870,865
Total	$20,381,265	$20,691,634

†Represented by 4,172 shares of old $100 par stock and 743,348 shares of new $10 par stock. *After depreciation.

White Eagle Oil

The statement of the White Eagle Oil & Refining Co. as of June 30, 1927, as of June 30, 1927, compares as follows:

Assets

	June 30, 1927	Dec. 31, 1926
Real estate, equip., etc.	$19,333,671	$18,358,734
Oil and gas leases, etc.	5,806,896	5,806,896
Cash	301,236	832,570
Money loaned on call	300,000	.....
Sink. fund debentures	100,000	.....
Notes receivable	121,016	30,949
Accounts receivable	1,860,400	1,442,303
Inventories	3,686,081	2,968,000
Cash surrender ins. pol.	68,434	64,253
Investments	158,123	158,123
Deferred charges	312,349	143,685
Total	$32,048,206	$29,865,503

Liabilities

*Capital stock	$9,438,258	$9,438,258
Notes and accept. payable	.....	850,000
Accounts payable	693,674	655,742
Other accruals	152,992	82,246
Dividends payable	245,000	245,000
Est. fed. taxes payable	89,144	127,322
Sinking fund	5,000,000	2,000,000
Deprec. reserve	4,605,129	4,651,381
Res. for depletion and amortiz.	5,705,796	5,705,796
Contingent reserve	346,391	354,791
Deferred liabilities	.....	486,221
Earned surplus	3,414,598	2,911,522
Capital surplus	2,357,224	2,357,224
Total	$32,048,206	$29,865,503

*Represented by 490,000 no par shares.

NEW YORK STOCK EXCHANGE—LIST OF ACTIVE STOCKS

Stocks—	Par	Clos. quot. Oct. 17	Oct. 10	1927 High	1927 Low	1926 High	1926 Low	1925 High	1925 Low
Amerada Corp.	..	29	29½	37⅛	27⅝	32⅝	24⅝	..	..
Atlantic Refining, com.	100	113¼	115	128½	107	128¾	97	117½	95½
Barnsdall "A"	25	21¼	21⅛	35½	20⅝	32½	23½	33½	18¾
California Petroleum, com.	25	20¼	20⅝	32⅜	20⅛	38⅛	30⅛	34⅜	23⅜
Houston Oil	100	166⅝	174⅝	174⅝	60⅛	75	50¼	85	50
Independent Oil & Gas	..	20½	19¼	32⅜	17⅝	34	20¼	41⅜	13½
Louisiana Oil	10	10⅝	11	13⅛	10⅝	19⅝	12	23⅜	13⅜
Maracaibo	..	13	13	22⅝	12	37⅜	13⅜	35½	20⅜
Marland	..	32⅞	32¼	58⅛	31	63⅝	41¼	60⅛	31⅝
Mid-Continent Petroleum	..	25⅝	25⅞	39⅝	25⅝	41	25⅝	38	25⅝
National Supply	50	87½	88	95⅜	76	84⅜	55½	71	54⅜
Oil Well Supply	25	32	32⅛	44⅜	31¼	36	30	38	33⅜
Pan American, B	50	43⅛	47	66⅜	45⅛	72⅜	56⅛	83⅜	59⅛
Pan American, Western B	..	17⅛	17¼	37⅞	17⅛	46	34	94⅜	37¼
Phillips Petroleum	..	38⅞	38⅛	60⅛	38⅞	54⅞	42⅛	47⅛	37¼
Producers & Refiners	50	26⅝	27⅛	33⅞	16⅜	26	11	32⅜	12⅛
Pure Oil, com.	..	25	25⅜	33⅛	25	31	25⅜	33⅜	22⅛
Royal Dutch, N. Y., sh.	13.40	46	45¼	54⅛	46	57⅜	49⅜	57⅜	48¼
Shell Transport	10	42⅛	41⅜	49	41⅛	48⅞	42	49	30⅜
Shell Union, com.	..	25	25⅛	31⅜	25	30⅜	24	28⅜	21¼
Simms Petroleum	10	17	16⅝	22⅜	14½	25⅝	16½	28½	18¾
Sinclair Consolidated	..	16⅝	16⅞	22⅜	15⅝	24⅞	16⅜	24⅞	17
Skelly Oil	25	25⅜	24⅝	37⅜	24¼	37¼	27	32½	21⅜
Standard of California	25	53	53	60⅜	50⅜	63½	54	67¼	52½
Standard of New Jersey, com.	25	38⅝	38⅝	41⅞	35½	46⅜	37½	47½	38⅝
Standard of New York	25	30½	30⅝	34¼	29⅞	47¼	30⅝	48⅝	40
Sun Oil Co.	..	31⅝	31	34⅞	30	41⅝	30½	43⅜	38½
The Texas Company	25	49⅝	49⅝	58	45	58	43	55	43⅜
Texas Pacific Coal & Oil	10	13⅜	13⅜	18⅜	13	19⅛	12⅛	23⅜	11
Tide Water Associated Oil	..	15½	15½	23½	15½	21	17	..	..
Transcontinental	..	7⅞	6⅝	8⅜	3⅜	5¼	3	5⅝	3½
Union Oil of California	25	42⅝	41⅝	56⅛	39⅝	53⅜	37¼	43⅜	38⅛
Union Tank, com.	100	109	109	115	95	120⅝	84¼	‡134	118
White Eagle Oil & Refining	..	22	23	27½	22	29⅜	25⅛	28⅜	25⅝
Standard Oils									
Anglo-American Oil	£1	18½	18⅜	21⅝	18½	19⅜	16½	26⅜	17⅛
Borne Scrymser	25	56	56	69	49½	75	65	$240	205
Buckeye Pipe Line	50	55½	55	58	45	59½	42	72	63⅛
Chesebrough Manufacturing Co.	25	112½	110	108	76⅛	81½	63	74	48¼
Continental	10	17	16¾	22⅝	16¼	25⅞	10¼	31¼	21⅞
Cumberland Pipe Line	100	91½	90	‡137	90	137	102	156	128
Eureka Pipe Line	100	57	58	61	47	53⅜	43	96	61¼
Galena Signal, com.	100	7⅛	7½	13⅛	7⅛	32½	9⅜	68½	23½
Humble Oil & Refining Co.	25	60	61¼	64¾	54	99⅝	52	99	40½
Illinois Pipe Line	100	163½	163	164¾	123¾	144	131	154½	124
Imperial Oil	..	61	56⅜	61	37⅜	39⅜	32½	39¼	27¼
Indiana Pipe Line	50	75	*75	77	61	68	52¼	84	57¼
International Petroleum Co.	10	31½	30⅛	34⅞	28⅛	35⅛	28⅜	25⅝	20⅛
National Transit Co.	12.50	16	16	17⅜	13⅝	30⅜	27¼	25½	16⅛
New York Transit	100	34½	34	36	31¼	61⅛	27¼	70	50
Northern Pipe Line	100	82	84	88	70	80½	64	88	67½
Ohio Oil Co.	25	58	59	64¼	52	67⅛	55⅜	75⅛	60
Penn-Mex Fuel	25	27⅜	24	31	13	24⅛	15	44	19
Prairie Oil & Gas	25	47	48⅝	55½	45⅝	60¼	49	65⅛	45⅜
Prairie Pipe Line	100	179⅜	180	185	132	137½	122½	129⅝	105
Solar Refining Co.	100	180	181	‡201½	178	212	184½	259	200
South Penn Oil	25	36	37	37⅛	31⅛	50	30	‡157	139
Southwest Pa. Line	100	70	73	77	55½	56	47½	84	50
Southern Pipe Line	50	21	21½	‡27¼	18½	27	24	‡103	63
Standard of Indiana	25	71⅝	71¾	74⅛	64¼	70½	60½	79⅜	63⅛
Standard of Kansas	25	15⅝	16⅛	20⅝	15⅝	36½	16⅛	46	30
Standard of Kentucky	25	118	118⅛	123⅛	111⅝	134⅝	108	137	114⅜
Standard of Nebraska	25	43¼	42⅝	49⅛	43¼	51⅜	42	‡270	231
Standard of Ohio, com.	100	76⅛	77	‡354	294	362	192½	369	338
Swan & Finch, com.	25	20	17	17	15	21	18	27	12
Vacuum Oil	25	126½	125	134	95⅛	109⅝	94⅛	109⅛	80⅛
Miscellaneous									
Gulf Oil Corp. of Pa.	25	*90⅝	90¼	96½	86¼	95	82½	98⅛	63½

*Bid, no sales. ‡Old stock. †New stock.

Quotations furnished by W. J. Wollman & Co.

The Oil and Gas Journal's weekly average price of 20 representative petroleum stocks listed on the New York Stock Exchange was as follows:

Oct. 17	59.22	Sept. 12	61.20	Aug. 8	61.33
Oct. 10	59.20	Sept. 5	60.60	Aug. 1	60.38
Oct. 3	60.97	Aug. 29	60.41	July 25	60.55
Sept. 26	61.30	Aug. 22	61.58	July 18	60.36
Sept. 19	60.83	Aug. 15	61.05	July 11	59.36

LOUISIANA-ARKANSAS REFINED MARKET WEAKER

SHREVEPORT, La., Oct. 17.—With the exception of kerosene, which continued firm, and gas oil which showed a tendency to strengthen, the North Louisiana-Arkansas refinery market reflected a weaker tone the past week and Monday the outlook was not encouraging. Gasoline, which during the first half of October was strong due to the fact that refiners had disposed of their entire production in advance, is easing up very materially and while there isn't much distress accumulation as yet some North Louisiana sellers Monday were quoting U. S. Motor fuel on northern markets at 6¼ cents with the differential territorial demand not sufficient to move the entire production at 6½ cents. Fuel oil also weakened off due to the lack of spot demand and could be purchased Monday easily at $1.05, it was reported, although the quoted market ranged as high as $1.10.

With the increasing demand, the oil market took a decided turn for the better during the week and Monday this material was not available for northern buyers under 2¾ cents. Orders in differential territory easily were bringing from 3 to 3¼ cents. Kerosene continued firm because of the scarcity of the product and its limited production in this division. Quotations were firm at 4¾ cents. Natural gasoline showed little change with purchases of material from Louisiana and Arkansas points being made on a basis of a quarter cent above North Texas quotations.

NEW MANAGER OF SALES

CHICAGO, Oct. 15.—H. H. Scott has been appointed manager of the light oil department of the Acme Petroleum Co., of this city. Mr. Scott was for six and one-half years the Pittsburgh representative of the Imperial Refining Co. of Ardmore, Okla., and previously was with the Great Southern Refinery at Lexington. He has also had experience as a distributor. He assumed the duties of the office October 10.

EASTERN REFINED OIL MARKET IS WEAK

(Continued from Page 159)

nent, option, from U. S. Gulf, 16s. 6d., option Talara, 23s.

Tanker Dagland, California to United Kingdom-Continent; November loading, clean, 26s., two ports of discharge.

Tanker Nord Atlantic (Ger.), 6,000 tons, November loading, Black Sea to United Kingdom-Continent, 17s. 3d.

Tanker A. E. Watts, November loading, Venezuela to north of Hatteras, two trips, at 21 cents.

Unnamed American tankers (2) chartered to carry gasoline from California to north of Hatteras, 24 months consecutive voyages, at 80 cents a barrel.

The tanker movement of petroleum to the Atlantic Seaboard for the week ended October 12 was estimated at 3,921,000 bbls., a daily average of 560,000 bbls., against 3,349,000 bbls., or 478,000 bbls. daily, for the week ended October 5. The Gulf Coast for the week ended October 12 contributed 2,642,000 bbls., or 378,000 bbls. daily, the Pacific Coast 441,000 bbls., or 63,000 daily, and imports were 838,000 bbls., or 119,000 bbls. a day.

In the import column, South America continued to make the largest contribution, while that of Mexico declined. In the figures given all imports from Venezuela made through Aruba, Curacao and other Dutch islands off the coast are counted from Venezuela, from which country all the oil originates.

Lloyd's quarterly report on shipping shows a continued increase in oil tanker construction and in construction of Diesel engine propelled vessels.

No break is indicated in the increased production of tankers. The figure for the September quarter shows a gain of 50,000 gross tons in world construction over the previous quarter. For Great Britain and Ireland a slight gain is shown and for the United States a small decrease, practically all the advance being made by the other countries, as shown in the following table of gross tonnage of tankers under construction, steam and motor, of 1,000 gross tons each and upward:

	Sept. 30, 1927	June 30, 1927
Great Britain and Ireland.	404,592	400,992
United States	22,900	24,150
Other countries	348,140	300,284
Total	775,632	725,426

How sharp the extension of tanker construction has been during the past year is seen by a comparison with the figures for the quarter ending September 30, 1926, when the world total was only 251,000 gross tons.

Diesel motor vessel construction is again a feature of Lloyd's returns, a gain of about 130,000 gross tons being shown by the new figures, following the very sharp advance of almost 300,000 tons in the quarter ended June 30. Over 700,000 tons more of ships equipped with internal combustion engines are now in hand than there were at this time last year, when the total for all countries being constructed was 869,000 tons. Germany seems to be leading all countries in increase in construction of motor ships.

More than half the present shipbuilding of the world is being devoted to motor vessels, the total of 1,589,000 gross tons comparing with 1,585,000 for all other types of vessels combined. Of the present motorship construction 41 per cent is now being done in the yards of Great Britain and Ireland, 15 per cent in Germany and 44 per cent by the other shipbuilding countries taken together. The continuing trend toward motor propulsion is also indicated in Lloyd's returns of the power of various types of marine engines being built or installed throughout the world, the figures of oil engines showing an advance during the last quarter, while those for reciprocating engines and steam turbines declined.

The total indicated horsepower of the oil engines reported for the quarter ended September 30 was 1,163,630.

Petroleum Receipts

The following table shows estimated daily average receipts of crude and refined oil by water at Atlantic Coast ports for the last three weeks; also monthly record for the past 12 months (figures in barrels):

	Week Ended— Oct. 12	Oc.. 5	Sept. 28
Gulf Coast	378,000	233,000	305,000
Pacific Coast	63,000	128,000	71,000
Mexico	28,000	27,000	49,000
South America	91,000	91,000	106,000
Total	560,000	479,000	531,000

Daily Averages by Months

1927:	Gulf	Pacific	Mexico	S. Am.	Total
Sept.	336,000	97,000	69,000	99,000	601,000
Aug.	397,000	90,000	80,000	78,000	645,000
July	406,000	83,000	78,000	49,000	616,000
June	378,000	118 000	68,000	47,000	611,000
May	332,000	58,000	91,000	53,000	534,000
April	388,000	93,000	69,000	61,000	611,000
Mar.	345,000	103,000	36,000	81,000	565,000
Feb.	379,000	89,000	40,000	48,000	556,000
Jan.	362,000	73,000	49,000	61,000	545,000
1926:					
Dec.	363,000	57,000	49,000	61,000	530,000
Nov.	335,000	62,000	56,000	40,000	493,000
Oct.	270,000	71,000	61,000	43,000	445,000

The foregoing figures are based on the carrying capacity of incoming oil-laden tankers.

LIGHT DEMAND IN CHICAGO MARKETS

(Continued from Page 158)

up on its popular grade of fuel oil until the first of the year. This oil is a 16-20 gravity but competing concerns state that it is a fine oil and worth all that is asked for it. Some of the sales are stated to have been on the basis of 72½ cents, Group 3 basis.

In a general way there has been no change in the attitude of buyers who are still ordering for short periods only and seeking to buy at the lowest possible level. The prices have been steadily maintained on the higher gravities and only fairly held on below 24-26 gravity. Good zero oils are beginning to command a premium. It is really a waiting market with refiners expecting an improvement in the demand which will help them to secure better prices and the buyers holding off for a large demand for their own products and expecting that a cut in crude will be a signal for lower fuel costs.

Smackover Easier

Refiners deny this and say that any lower costs for crude have been already more than equaled by the reduction in the prices for the fuel oil. Smackover crude is easier, but how much of it comes from the Smackover Field is problematical. A good deal of Urania crude has been sold for fuel oil and other crude oils have been shipped to take the place of the dwindling supply of real Smackover fuel oil. For some purposes it makes little difference. The fuel oil market is not a satisfactory market to refiner, dealer or distributor and the buyers who should be satisfied with the prevailing prices seem to be the most discontented of the whole series of those interested in the fuel oil situation.

Lubricating oils show no change here. The movement is steady and prices unchanged according to refiners. The electric light companies have asked for prices on transformer oil under specifications recently put out which call for a lower coldtest. A perfect emulsion is required in this product which is not very generally refined, only a limited number of the western refiners making a transformer oil. Some of the local lubricating oil and grease men are finding the industrial demand rather slack, but generally this branch of the oil industry seems to be working along former lines so far as prices and demand are noted.

Gasoline Consumption Greater

The consumption of gasoline as indicated by reports of leading distributors was substantially greater over this territory during September than a year ago. An estimate of 15 per cent increase as an average would be in line with statements made. Kerosene also showed larger sales as a whole. The first half of September was very warm, the largest period of high temperatures that we have had this season and the consumption was heavy.

October is running about equal with last year, but is expected to show a gain by the end of the month. The first half of the month was cool and very rainy and it is hoped that the latter half will be of the nature of an Indian summer. The heaviest gasoline business is behind us for this year, but the use of the auto is so general all seasons of the year that a large consumption is assured. At little stimulant to trade may be made by the advent of the new Ford car, which is understood to have passed the final tests and to be in production. It is reported from Detroit that 150,000 cars have been actually contracted for, some part of the price having been paid, and that 250,000 have been ordered on which no payments have been made. Oil men in Detroit state that from what they have been able to learn the car is a sort of Lincoln reduced in size. It has something of the lines of the Lincoln car and is stated to be very speedy. Visitors are not admitted to the testing grounds or show rooms, but distant glimpses have been had of the car on the test track.

Tank Wagon Unchanged

The country price situation has shown no material change. There has been no change in the tank wagon scale. At Indianapolis the Standard Oil Co. has reduced its tank wagon price 1 cent and left the station price unchanged, so that the station and wagon prices in that city are no longer the same. This is additional evidence that the alleged plan of a flat price has not been put into effect. There were no announcements of changes in price at important points in the territory during the week not previously reported but at several minor points price changes were made to meet competition. There was less activity shown in cutting prices over the territory but no advances were reported from points where the prices were below normal. Even with the wide margin there is less temptation to cut prices when the demand is light and every dealer knows that there will be little response to such inducements to purchase.

Local fuel oil distributors are busy making initial deliveries to homes and their regular fills to the larger class of buildings, but there has been no second orders from homes for domestic fuel oil oil. We have had several nights of near frost but no really frosty weather. There has been no change in the price lists of the distributors but considerable talk of active competition for business which has at times resulted in some form of concession.

Over in the Ohio territory reports are made of continued trouble in spite of the decline in gasoline wagon and station prices. Retailers are fighting for business and are getting some very low prices. Jobbers have stated that they could buy U. S. Motor gasoline at prices equivalent to a 5½-cent cost Group 3. Some low fuel oil prices are also being quoted out of surrounding states as well as by local refiners. The condition today in Ohio is stated to be a good argument against the solution of the price situation by a lower tank wagon price list. Shipments from differential points are making quite a bit of trouble in other states. Michigan distributors report the offer of U. S. Motor gasoline out of the Chicago district at a price of 7.57 cents, f.o.b. shipping point, which cuts under the delivered price from Group 3, even on a 6-cent basis. In fuel oils some of the near-by refiners are making a very good thing selling freight, for that is just what it amounts to, and the buyers like the nearer shipping points for it gives them prompt deliveries, which means that they can get along with less stocks.

THE OIL PROBLEM; CAUSES AND REMEDIES

(Continued from Page 41)

yet experiments strongly indicate that after the field is abandoned the operator can go back and by closing all except a few wells, and injecting air in some instances, water in others, recover a considerable part of the remaining oil. Now, under the oil-gas ratio and unit operation plans, both also experimental as yet, I understand it to be claimed that as much as 40 per cent of the oil can be extracted. Therefore the question, in connection with the problem we are considering is this: Is it wise to extract the further quantity now or leave it in the safest of all reservoirs, with the chance of extracting it later on at a much increased cost? It would be to the advantage of the industry to get it now, but what is to the interest of the public and the nation? My thought is that if the Government will demonstrate ability to get our oils from substitutes, the danger of lack of them being removed, the operators could adopt such methods, if then satisfied that they are efficient. Indeed, there would probably be no power to prohibit their voluntary adoption. But until this demonstration shall be made, it seems to me it would be inadvisable for any branch of the Government to recommend them, and certainly unwise to try to compel their use.

The second objection is that both the oil-gas ratio and unit operation plans call for the passage of some law or creation of some commission to enforce them. I think the industry is now fettered with too many laws. For example, take the oil-gas ratio plan. No one should wish to compel, no legislature would compel, its adoption until well proven. Then there will be a force compelling its immediate adoption—that is, the self interest of the producer. It is incredible that any producer would fail to adopt any method as to which it shall have been proven that it will produce more oil, and more profitably, than under present practices. Further, I think there is now ample law to compel its adoption when proven. A lessee is under obligation to operate the lease with skill. This obligation remains fixed, but the degree of skill required increases with the development of the art. When it shall be proven that under a new method the lease can be made to produce more oil, and yet the operation be as profitable, the lessee must use it. His failure to do so may forfeit his lease. I have heard it urged that lessors would not enforce this duty as they wish quick and large production, and would favor the use of all of the gas to lift as much oil as possible, as quickly as possible. Lessors will learn; they will not prefer to receive half a cake in one hour to a whole cake in two hours. Besides, it seems to me that the power to compel the use of the later and more profitable method of producing oil would not be confined to the lessor. I think this could be compelled by the owner or lessee of any adjacent property by injunction against the operator following the old method proven to be wasteful. Of course, there is no precedent for such an injunction, but we need none, as it is the delight of equity to find a remedy for every wrong. This would be the case: assume the art of producing oil so developed that it could be proven that more oil could be extracted, and more profitably, by the reutilization of the gas than by allowing it to escape from the well naturally; one operator refuses to follow such improved practice; assume further it could be proven that the waste of gas by that operator will keep the others from getting as much oil from their property as they could if the recalcitrant operator should conserve the gas. It would require no proof of how much oil the complainant would be prevented from producing, but merely that his total output would be materially lessened because of the conduct of such recalcitrant. Upon the principle that no one can use his property in a manner that will injure the rights of his neighbor, it seems to me that the injunction should issue to prevent the waste of gas.

Unit Plan of Operation

With respect to the unit plan of operation, that contemplates grouping of leases and the drilling of fewer wells. My surmise is that, if it shall be proven to be the desirable method of operation, the industry will not need new laws so much as new leases, so that the lessees may have the unquestioned right to adopt it.

There is another reason why I think it would be unwise to compel by statute the adoption of any new method of producing oil, no matter how confident its advocates may be of its soundness. It makes a system too rigid. Thus, suppose Oklahoma by statute compels operation under an oil-gas ratio, either fixed in the law itself or by a commission, and a better method should be found. The predicament then of the industry would be very serious. It would have substituted for the present wise rule that the

lessee must operate skilfully, under which he would be required to use such better method as soon as it should be proven, a hard and fast statute compelling adherence to the oil-gas ratio. The lessee could not adopt the better method without violating the law; obviously neither the lessor nor any lessee on adjacent property could compel him to do this. In an industry so rapidly developing, with useful innovations so frequent, is it wise to bind it with fetters that can be unloosed only at the pleasure of the legislature? Are the operators content that the methods of producing oil shall be determined, not as heretofore by them, spurred by the attractiveness and opportunities of the game to the exercise of the highest ingenuity in a field that permits its very wide exercise—but by Legislatures, whose entire honesty may be readily conceded, as their complete ignorance of the art is not to be doubted. Yet this predicament would come unless we assume—and be correct in assuming—that the industry now knows it all, and that hereafter there can be no possible improvement in the methods of producing oil. Let all improved processes to extract oil from the ground, or to lessen the cost of its production, or to stabilize the production, come, and adopt them when they come, but do not attempt to force such adoption by compulsion; let it be natural as other improvements have been adopted in an industry in which the fullest freedom of individual effort has resulted in the quickest great business development ever known. But, above all, do not bind and fetter it by a lot of laws, rules, regulations and orders. These will destroy the very force that has made it great.

However, I think much can be done, and should be done, not by legal restraint, but through voluntary, intelligent conduct of the producers:

Through agreements to restrict production in developed fields.

Restricting Production

Considerable has been done in this regard, and much more will be done, I think, when a continuance of overproduction shall force the industry to a fuller realization of the condition confronting it, and when financial statements indicate constantly decreasing profits or increasing losses. Then I think there will be less lack of faith that the others will comply with these agreements, more willingness to risk the loss of some oil in a particular field in order to get the benefit accruing to the general markets through restriction of production, and more disposition to act sensibly to avoid a common disaster.

Through agreements to withhold production where mere discovery but no substantial development has been had.

More can be done in this way, for I am told that in most of these embryonic fields there are only a few interested. To develop them, especially those in West Texas, and sell the crude at present prices, which a short delay may double, is so unbusinesslike as to warrant the belief that their production may be withheld. I take it the chief difficulty will be the demands of the landowners for development. Certainly the Legislature of Texas should be requested to modify the drilling requirements in leases on university and state lands; certainly also Congress should give to the Secretary of the Interior a discretion to withhold leasing and drilling. If the individual landowner cannot be persuaded that delay will be to his interest, possibly it can be procured through some plan of advance payments against royalties to accrue.

In my judgment the greatest obstacle to restricting production and development is the antitrust laws. This I shall discuss later.

Through further use of scientific means to find oil and improvements in appliances for deeper drilling.

This cannot be properly classed as a suggestion for conservation, but it would accomplish the same purpose, if we could increase our knowledge of the existence of oil deposits and our ability to secure them. In the last few years science has played a large part in the finding and production of oil. A monopoly might suppress a scientific invention or discovery by refusing to use it; but in a highly competitive industry this is impossible. Since it will be used by some, it must be used by all, to give equal opportunity in the competition. Since the entire industry will avail itself of the aids that science can give, my thought is that it should be used to the greatest possible extent. By increase in our knowledge of geology and perfection of our geophysical appliances, oil has been found at many places and at depths before unknown. Further advance in these regards will add greatly to our knowledge concerning the amount of our petroleum resources, and increase our ability to get them when needed. Better machinery and better and stronger casing will enable the industry to reach much lower depths. By improvements in this way we may hasten the day when a dry hole will be a mute evidence of the stupidity of the operator in drilling without seeking scientific advice, or that such advice as he sought was incompetent. Again, there may be perfected some form of core drilling for prospecting of large areas cheaper and more rapidly than is now done by ordinary wells. The immediate benefit of such advancements in the art would inure to the industry; but the expense of producing oil enters into the price the public pays, and any economies that can be made benefit the public.

A Plea for the Oil Industry

Let us first determine whether its record of achievement is commendable. Reports of the Department of Labor show the prices in 1926 for the quantities that could be purchased for $1 in 1913 of these commodities:

House furnishings	$2.28
Bituminous coal	2.05
Brick	2.04
Woolens and worsteds	1.94
Lumber	1.85
Boots and shoes	1.85
Building materials	1.63
Cotton goods	1.60
Foods	1.55
Meats	1.53
Grains	1.48
Farm products	1.42
Structural steel	1.35

These reports do not show the comparative price of gasoline in the years referred to, but the Year Book of the Department of Commerce for 1925 shows a cost of $1.06 for the quantity of gasoline that $1.00 would buy in 1913. Yet I think there is no doubt that the demand increased far more for gasoline than for any of the other commodities mentioned. This is a record the oil industry may be proud of.

Frequently we see statements, put alarmingly, in the press and from our public men concerning the production of oil, and complaining of the industry that it does not stop the same. This is most unfair. Can you think of any way to lessen production, except by agreements among the operators not to drill wells, or not to produce oil therefrom? Yet in most of the states of oil production I think in all of them—there are laws forbidding this. For example, those in Texas forfeit the charters and impose very large fines upon the corporations, and such fines and penal sentences upon the individuals, who make agreements "to limit the output of any article that may be mined or produced." Before the public complains that the industry does not restrict the production of oil, should it not permit the latter to adopt the only means by which this can be done?

Antitrust Laws

Antitrust laws are based upon the sound propositions that law prices benefit the public, and that they can be assured only through the maintenance of competition; therefore they wisely prohibited the stifling of competition. But the test generally prescribed in these statutes for their application is the effect of the agreement upon the consumer. If the price to the latter is increased, the agreement is condemned. This test is too narrow; its application often destroys the very competition that these laws are designed to assure. Obviously, the true interest of the consumer is to continue the competition for through that means only can he be assured of low prices. But the stifling of competition by agreement is not the only means of destroying it. Bankruptcy—that is, the inability of some of the competitors to continue in business—will just as effectually destroy competition. Hence those trade agreements that are essential to permit the competitors to continue in business and to continue to compete, are to the benefit, not to the detriment, of the public, and, although they may raise the price to the public, they should be upheld in its interest. This is the rule in every other English-speaking country. It is to be hoped that the rule of reason laid down by the Supreme Court may presage its adoption here.

In its report the Federal Oil Conservation Board says that these antitrust laws have served "as an actual or imagined or pretended barrier to co-operate action to limit oil production." I do not doubt that there are instances in which these statutes serve as an excuse, unanswerable, for the refusal to enter into these agreements by some, who could otherwise be persuaded to fair and considerate conduct. But in the majority of instances these antitrust laws are neither imaginary nor pretended barriers. I dobut if there be any lawyer connected with this industry who would advise entry into agreements in conflict with the letter of these laws. The executives—who in these days are seldom the owners—of the companies always hesitate, and often refuse, to assume the risk of making such agreements.

More Petroleum—Less Restraint

The truth is that the politicians have made it almost impossible for the industry to do anything to protect itself or the public. In strict justice the next move is up to the public, though no one would advise, until that move shall be made, delaying the doing of anything that the industry can do. But the oil industry has the right to demand that the public shall treat it fairly. Let not the public, or its representatives, threaten this industry with asphyxiation, through control by state commissions, if it shall not restrict production, and continue to hold over it the menaces of corporate deaths and felons' punishments, if it shall adopt the only possible means to restrict production.

Recently the press carried an interview with Secretary Hoover, for whom I have the highest respect, as have all the people. He calls upon the "doctors of law" to show the way out. If a connection as a lawyer for many years with this industry would include me within such distinguished appellation, I am pleased to respond to this call. The way out, Mr. Secretary, does not lie through further restraints, but through more freedom to the industry. Freedom to protect itself and to protect the public. This freedom the industry cannot secure through any effort of its own. It is the least understood and most unpopular of all the industries. For it to attempt to get this freedom, in my opinion, would be so absolutely hopeless that I would not recommend that the attempt be made. This freedom must come through the pressure of public opinion. Our public men, our leaders of thought, must convince the public that it is absolutely necessary, in its own interest, that this freedom be granted. The Federal Oil Conservation Board, I think, should take the lead in saying to Congress and to the Legislatures that the antitrust laws must be so amended at once as to permit the oil industry, through agreements, to restrict production of oil, and that this is essential in the interests of the public. If you please, let your recommendation be to confine the operation of these agreements to the times when the production of oil shall be in excess of the market's requirements. I am unable to conceive of any way in which the exercise of such a right could be made a means to oppress the public. The Federal Oil Conservation Board has said that the oil industry should regulate itself; this was just, fair and proper. It has never had a fair chance to do so; I fear it will never have this chance so long as there hang over it the menaces of these antitrust laws.

Waste in Distribution

Further, these antitrust laws drive the industry to its largest waste—also referred to in the interview of Secretary Hoover. This is the multiplication of filling stations. It does seem silly to find six or more filling stations in a hamlet whose consumption of gasoline would not support one. But the industry is impotent to prevent this. Automobiles generally are filled at these stations. To sell its gasoline for this principal consumption, each company must establish these stations. It would be delighted to find some territory unoccupied by these stations. There is none such. Consequently, each goes into each town, village or hamlet, and this waste occurs so that, of course, the public finally pays in the price of the gasoline it buys. The only way to avoid this would be to permit the companies to agree upon a division of territory. Much of this waste could be avoided, even if such permission was so limited as to require two stations in each place to assure a continuance of competition. But no company in this nation would dare to make these agreements, no matter how limited. The antitrust laws forbid. I see no hope to avoid the continuance of this large waste, unless, at some distant date, the public may realize that overproduction is nearly as hurtful to its interests as the entire lack of competition. But again I ask, is it fair to condemn an industry for waste, and yet deny to it the only means to avoid that waste?

How the Exhaustion of Oil Would Come, If It Shall Ever Come

Fortunately, there is in this oil situation a strong factor of safety. This is that nothing serious can happen suddenly. There can never come a time when on one day the public's needs for refined oils shall be fully supplied and on the next day there shall be no oils. I believe that if the exhaustion of petroleum shall ever come, it will come gradually—so gradually that the public will never lack for oil. No oil field blows up or suddenly ceases altogether to produce. There is always a gradual decline—in most fields a very slow decline—extending through many years. There are wells still producing that were brought in 30 or more years ago. The coming exhaustion would be indicated long before its arrival by the failure to find new fields and the gradual decrease of production in the discovered ones. No one who reads the newspapers would lack knowledge that such exhaustion is coming long before it shall come. This would be indicated by the increasing price of oils, due to their scarcity. These increasing prices would make possible the most extended use of the cracking process, with result that virtually the whole barrel of crude would be converted into gasoline, and consequently it would take less oil to satisfy the public's requirements. The increased price of gasoline would cause the public to demand motors using less gasoline. These the automobile makers can and would supply, and hence there would follow a decreased consumption of gasoline. As the exhaustion would increase the companies would go to the use of the substitutes. This change to the substitutes would not be made by all of the companies at the same time, for some have much larger petroleum resources in the ground than have others. Nor would any company at any particular time switch its entire operations from petroleum to a substitute; nor, probably, would all the companies use the same substitute. Plainly what would happen would be that as each concern should find itself unable to get the petroleum to supply its requirements, it would use some substitute to make up the deficiency, enlarging this use in the degree that the inability may increase. Some might use as a substitute the shales, others coal, others lignite; this would depend entirely upon what particular substitute would be most economic for it to use in the locality in which it might operate. When we consider the past record of this industry for efficiency, the tremendous importance of a correct handling of this proposition to the companies in this industry, the economic loss that a bungling conduct thereof would entail upon the stockholders; when we reflect that this is the great American business, of which all others are but copyists, and as typically American as is baseball,

our national sport; when we remember that it has never failed to meet every need of the public for oil, and that it is probably the only industry whose record is perfect on the supply of its products during the war—does it not seem to the reader that this industry may be safely trusted to handle this proposition?

Is There Any Real Danger of Exhaustion of Our Petroleum Resources?

My belief is that we shall never lack for petroleum. It seems to me that the opinion that it will be exhausted soon is based upon fallacious reasoning. Thus, those who have this belief know that each barrel of oil extracted leaves that much less in the ground; from this they reason that continued extraction will cause exhaustion. This is true, yet it is no proof that such exhaustion will come soon; it may be centuries hence. The mining of each ton of coal or copper has the same effect, and its continuance will lead to the same consequences, but with them there is no fear of exhaustion. This is because these minerals in place can be measured and the quantities ascertained. Unfortunately, this cannot be done with oil with any degree of accuracy. It is because the quantity that remains cannot be ascertained that there arises the opinion that it will soon be exhausted. It is an opinion founded upon no proof; it is supported by no logical reasoning from any accepted promise; it originates in and is based upon fear—fear of a calamity coming to civilization—a fear frossly exaggerated because those who have it usually do not know of the substitutes for petroleum from which could be extracted the oils needed for civilization, and of the ability of the industry to meet that contingency.

We should never expect any governmental inquiry to report the conclusion that our oil resources will not be soon exhausted. In making this statement I say sincerely that I mean no reflection upon the integrity or intelligence of those who conduct these inquiries. But they will be dealing with a quantity unknown and unknowable; they will be deeply conscious—and properly so—of their responsibility in the inquiry and of the consequence—calamitous as they will think—that such a report, if erroneous, might entail. The very fear referred to will always cause them to report alarmingly and to counsel strongly the utmost conservation of our oil resources. They cannot be expected to counsel otherwise.

There have been many alarms—such as the exhaustion of timber, sounded about 30 years ago by well-meaning theorists who were unable to visualize the era of reinforced concrete; and the exhaustion of coal, prophesied by that patriot, Mr. Roosevelt. But I recall no instance in history of the exhaustion of any natural resource. If this ever threatened, the ingenuity of man provided quickly a substitute. In the nearly 70 years of the life of the industry we have never lacked for oil. When we consider that it is now found in many places where formerly its existence was not even suspected, the vast areas unexplored for oil, our better equipment—through the advancement of geophysical science—for finding it, the ability to drill deeper, and to extract a larger percentage of the oil from the ground, and to convert practically all of the oil into gasoline, the improvements that can be made in motors, requiring less gasoline—all these reasons and others that could be mentioned, make me believe that the end of the oil industry will come, not from any exhaustion of petroleum, but from the invention or perfection of some means of producing power more cheaply than by the internal combustion engine.

Yet, after all is said, the fact remains that this exhaustion may or may not come. None of us knows. All of us merely have opinions. With me the decided weight of the evidence is that it will not come. This is the belief of nearly the entire oil industry. Yet in deference to the opinions of others—to relieve the anxiety of the public—to play safe—it seems to me plainly advisable for the Government to demonstrate, through experimentation with the substitutes that our nation and its people will never lack for oils. I wish nothing that I say to qualify my earnestness in this suggestion.

The Course the Industry Should Pursue

If my opinion be correct, that our oil resources will not be exhausted, that they will probably last longer than we shall have need for them, it seems to me that the businesslike course for the industry to pursue is to enlarge its markets, with effect to obtain better prices, and thereby insure its continued prosperity. Certainly if the Government will demonstrate that needed oils can be obtained at reasonable prices from the substitutes for petroleum, there could be no conceivable objection to pursuit by the industry of this course. In brief, I think the industry should make no effort to restrict by law supply to equal demand; this is an artificial means to increase prices generally unworkable, and clearly so here; but to use the means, sound in economics, to secure that result—of increasing the demand to equal the supply. This would be through enlarging the uses of oil. I am told that this can be done through increasing its use for the heating of office buildings, hotels, homes and by the railroads, steamships, Diesel engines, etc.

There must be a large part of our country in which oil can compete with coal for heating purposes. Oil heating is so much cleaner and quicker in operation, the oil so much more stable in quality, that I am sure that no one who has used oil would replace it with coal, unless the cost be very much less. Plainly, the use of oil could be much larger by the railroads, where it is the ideal fuel, and because it is so much more easily handled it should permit a substantial saving in wages. Also oil could be used much more in steamships; there it has many advantages; it is cleaner, more quickly loaded, vessels can be supplied with fuel at sea, it saves cargo space, makes it easier to prevent listing, etc. Through the perfection of the Diesel engine, the residual oils can now be used in the most economic manner, and the general recognition of this promises a very large increase in the demand for Diesel engine oil.

It is my understanding that the markets for such enlarged uses of oils have not been secured chiefly because of doubt by those who would use them to the certainty of supply. It would seem that the present condition of overproduction, if it shall continue so long as to be a real menace to the business as now conducted, should give the assurance necessary to permit this new business to be secured. In other words, that which now threatens the future of the industry may result to its advantage.

I think the serious objection to this suggestion to enlarge the markets and thereby increase the demand for oil, and the price thereof, is the risk involved.

Business One of Risks

Since when has it become the practice of the industry to fail to act—to cease going on—because it involves a risk? The whole business is one of risks; when a well is drilled, a pipe line built, a refinery constructed, or even when a filling station is erected. When a company pays a large sum for a property that its officers think will be productive, it risks the loss of same and the expense of exploration, if oil be not found, or if oil becomes so cheap as not to warrant operation of the property. The oil concern that never acts where there is a risk dies of dry rot. It is not the existence of some risk that should prevent the adoption of this suggestion; it is a question of the degree of risk. Is it so large as to be out of proportion to the advantages that success would bring?

The degree of risk depends upon whether supplies of crude will or will not continue to be large. If they shall continue to be large, there should be no loss, for I assume that the integers of the industry would continue to exercise the good judgment that has made them successful. If the supplies do not continue to be large there would be a heavy loss. Sometimes I think that we oil people have listened so much to conservationists that we ourselves have become obsessed with their fear thought. I have tried to consider this subject with all of the deliberation and care of which I am capable. It is true that we are now taking out more oil than we ever did before; it is also true that if we continue to do this, the oil will be exhausted earlier than it would if we took same more slowly. But I repeat that this is no evidence that the oil will be exhausted soon. To the contrary, the great areas that are known to be oil bearing, and such large production, only indicate to my mind that our oil resources are far greater than anyone has heretofore thought. I think that the fair conclusion is that the prospects for continuance of ample oil supplies is brighter than it has ever been since Colonel Drake drilled his well. I think Mr. Rockefeller and his associates, founders of this industry, in building the first refineries took chances immeasurably greater upon the continuance of an ample supply of oil than any that the industry would now take in trying to secure the enlarged markets for its oil.

The advantages that success would bring would be very great. Probably great in the earnings of the enlarged business, but of this we cannot be sure. But certainly great in the continuance of the profits upon the business as now conducted. I do not think that the industry fully realizes the strong probability that overproduction will last for a very long time. We are accustomed to consider overproduction as temporary because it has heretofore been so. But I think its cause now is wholly different from what it was in any previous instance. Then such condition resulted from chance in drilling; now it has resulted from the application of science at both ends—in finding oil and in extracting the gasoline. The inventions for finding oil have been in use only a very short time; they have found oil in many places that have not been developed, through a forbearance of the companies. I see no reason to doubt that these inventions will continue to find oil for an indefinite time. Judging the future by the past—especially by the near past—it is a fair conclusion that a production in excess of the requirements of the business as now conducted will continue for a long time. Experience has shown that it is unprofitable to purchase oil and hold it in storage. The excess of crude offered for sale over the quantity desired to be bought makes certain a low price. Pipe lines and refineries will operate to full capacity to take care of the production. The excess of refinery output over the demand cannot be taken care of through storage; all such output must be sold; this makes certain a low price for the finished products. This low price may mean a small profit, or no profit or a loss; for of course the cost of a commodity has no control over the price at which it sells in a serious condition of oversupply. Therefore, if the industry could secure larger markets and by this means avoid the consequences of oversupply, obviously the advantages would be very great.

Conclusion

That the road of the oil industry will be hard for some time seems plain. But it is a sound industry, based upon a large demand for essential commodities, and that demand is constantly increasing. I share the belief of nearly the entire industry that our petroleum resources will not be exhausted, that probably they will last longer than there shall be need for the oil. Therefore, I believe that the public can rely, with confidence, upon the resourcefulness and ingenuity of the industry to continue to supply the needed oils from petroleum.

But, if this belief should be wrong, and petroleum should be exhausted, I believe the industry would withstand the blow. To that part of it that is engaged only in producing oil, some partially compensatory benefits would accure. For with the appearance of this coming exhaustion, there would come high prices for producing properties, and for the petroleum obtained therefrom. To the part that is completely integrated doing the entire business from the well to the consumer this exhaustion would be a very violent blow. But the demand for oils would yet remain the companies would have the business of supplying that demand, they would know where and how to get the oils from the substitutes, and the change would come so gradually as to give them ample opportunity to adjust their businesses to it. With a business in hand that could continue to be conducted profitably, certainly it would go on. To assume that the companies would lie down—quit—would be entirely inconsistent with the record of all American business men and especially so with the records of the strong characters who have made and maintain this great industry. It could not be lack of capital that would prevent because the industry has never lacked for capital. With our country becoming increasingly prosperous, with more and more capital seeking investment, why should we doubt that it could be procured by an industry engaged in extracting essential oils from the substitutes? This would really be a more stable industry, because the receipt of its oils would be more regular and certain, and less subject to the fluctuations incident to the business as now conducted. I do not think that any one can state any sound reason to doubt that this business would go on and supply the needs of the public with oils from the substitutes.

I do not fear that petroleum will be exhausted. I do not fear that the public will lack for oils, if it be exhausted. But I do fear one danger. This may come at any time, but probably at the next period in which the quantity of oil produced shall be less than the amount consumed, and to make up the deficiency the industry shall be drawing upon stocks of petroleum held in storage for that very purpose. There will be nothing alarming in this condition, that has often presented before and that will present again. But the danger, as I see it, is that at such a time the public, already excited by the scare headlines and alarming prognostications in the newspapers, may be moved in a panic to protect itself against a danger that will not exist, but which it will believe to exist, and take the control of this situation from out of the hands of those only who will be ready and able to handle it. It is principally to this danger that this paper is addressed, in the earnest hope that it may induce some calmer, more deliberate thinking.

PHILLIPS PETROLEUM CO. SELLS OKLA. NATURAL

NEW YORK, Oct. 18.—Frank Phillips confirms the sale of Phillips Petroleum's interest in Oklahoma Natural Gas Co. to a new corporation formed by G. L. Obstrom & Co. to be called the American Natural Gas Corp. The Obstrom banking firm will manage the American corporation through R. C. Sharp, president of the Oklahoma company, who will be president of the American corporation. Some public financing for the American company will be done in the near future.

Mr. Phillips states the sale was made at a fair profit over the purchase price of a few months ago. Under the sale agreement, through arrangement with the purchasers, the American corporation will carry out the Phillips Petroleum Co. program for construction of a pipe line at a proper time to the Panhandle district and also will give the Phillips company preferential right to supply gas for its system as it may be expanded. The American company will also have a call on gas reserves comprising approximately 100,000 acres owned by Phillips Petroleum in the Amarillo Field. The American Gas Corp. will serve a population of 600,000 in 50 communities and its gas properties are estimated to have an open flow capacity of 2,500,000,000 feet daily.

BEDFORD A DIRECTOR

NEW YORK, Oct. 14.—F. H. Bedford, Jr., today was elected a director of the Standard Oil Co. of New Jersey. Mr. Bedford fills the vacancy left by his father, F. H. Bedford, who retired on January 1, last. Mr. Bedford was graduated from Amherst College in 1914, and entered the employ of the Standard Oil Co. of New Jersey in the same year. He is a nephew of E. T. Bedford, president of the Corn Products Refining Co.

WILDCAT OPERATIONS IN WEST TEXAS

(Continued from Page 46)

J. S. Cosden et al's No. 3 G. W. Connell-A, SE cor. NE Sec. 13, Blk. B-16. Elev. 2,849 ft. ..... Top pay 3,499 ft.; shut down 3,545 ft.

The Texas Company and Cosden's No. 1 W. E. Connell, SE cor. Sec. 24, Blk. B-16, School Land ..... Location.

FISHER COUNTY

Cranfill & Reynolds' No. 1 J. A. Young, Sec. 208, B. B. B. & C. Sur. ..... Moving in tools.

Hucony Gas Co. & Marland Oil Co.'s No. 1 Langford .... Hole full water 3,280 ft. and 3,690 ft.; shut down for orders.

Ideal Oil Co.'s No. 1 Jameson, C SE Sec. 111, Blk. 1, H. & T. C. Sur. ..... Hole full salt water 2,845-3,520 ft.; shut down 3,304 ft.

Marland Oil Co. and Texon's No. 1 McCall, Sec. 108, Blk. 3, H. & T. C. Sur. ..... Rig.

Miley Oil Corp. and Marland Oil Co.'s No. 1 W. W. Ammons, Sec. 198, Blk. 3, H. & T. C. Sur. ..... Hole full sulphur water at 3,665 ft.; total depth 3,711 ft.; underreaming 6-in.

R. W. Raney's No. 2 Maberry, Sec. 56, Blk. 1, T. & P. Sur. ..... Shut down for orders 2,725 ft.

Sinclair Oil & Gas Co.'s (was Bourdon Royalty Co.'s) No. 1 J. A. Danise, Sec. 6, Blk. K, T. & P. Sur. ..... Hole full water 2,830 ft.; show oil and hole full water 3,075-77 ft. in sandy lime; shut down 3,119 ft.

The Texas Company's No. 1 D. S. Stevens, C SW SE SE Sec. 79, Blk. 1, H. & T. C. Sur. ..... 8-in. froze 2,302 ft.; shut down.

GAINES COUNTY

Westheimer & Daube's No. 1 Birge & Forbes Land Co., Sec. 308, Terrell County School Land. ..... Cemented 8-in. 3,900 ft.; drilling 4,185 ft.

GARZA COUNTY

Emerald Oil Co.'s No. 1 D. Boren, NW cor. NE Sec. 137, Blk. 5, H. & G. N. Sur. ..... Small show oil in gray lime 1,884-1,902 ft.; shut down 2,600 ft.; show oil and hole full water 2,420-60 ft.

GLASSCOCK COUNTY

California Co.'s No. 2 W. B. Currie, Lease 1, NE cor. NW Sec. 213, Blk. 29 ..... Location; drilling water well.

Green et al's No. 1 F. G. Oxsheer, Sec. 6, Blk. 34, T. & P. Sur., elev. 2,540 ft. ..... Shut down for orders 3,661 ft.; hole full sulphur water.

World Oil Co. and J. S. Meriwether's No. 1 L. S. McDowell, C SW Sec. 43, Blk. 34, Twp. 2-S, T. & P. Sur., elev. 2,553 ft. ..... Top salt 1,180 ft.; hole full sulphur water 3,225-35 ft.; drilling 3,755 ft.

HOWARD COUNTY

California Co.'s No. 1 Fisher Brothers, SE SW NW Sec. 36, Blk. 33, T. & P. Sur. T-1-S ..... Shows oil 1,530-48 ft. and 1,562-64 ft.; hole full water 2,020-34 ft.; underreaming 10-in.

W. W. Donnelly et al's No. 1 Martin, SE cor. Sec. 41, Blk. 33, T-2 N, T. & P. Sur., elev. 2,552 ft. ..... Drilling 3,025 ft.

Henshaw et al's No. 1 W. R. Settles ..... Total depth 1,465 ft.; underreaming 8-in.; hole full sulphur water 1,335-80 ft.

Marland Oil Co.'s No. 1 Clay-E ..... Pay 2,480-2,500 ft.; swabbed approx. 160 bbls.; drilling 2,570 ft.

Marland Oil Co.'s No. 1 Richardson, C NW Sec. 12, Blk. 32, T. & P. Sur., T-1-S ..... Drilling water well and building rig.

Marland Oil Co. and Zoch's No. 1 Jones, Sec. 32, Blk. 27, T. & P. Sur., elev. 2,218 ft. ..... Shut down 500 ft.

Marland Oil Co.'s No. 1 A. M. Fisher, Sec. 1, Blk. 33, T. & P. Sur., T-2-S, elev. 2,730 ft. ..... Sulphur water 3,315-25 ft.; total depth 3,505 ft.; underreaming 6-in.

Marland Oil Co.'s No. 1-A Guitar Trust Est. ..... Top salt 1,215 ft.; drilling 2,970 ft.

Marland Oil Co.'s No. 1 A. G. Haines, C SE Sec. 20, Blk. 32, T. & P. Sur., T-1-N ..... Top salt 1,145 ft.; top lime 2,860 ft.; 1½ bailers water per hour at 3,210-30 ft.; hole full sulphur water 3,420 ft.; plugging.

Marland and Texon's No. 3 Settles, C SW Sec. 134, Blk. 29, W. & N. W. Sur. ..... New location; rigging up.

Mays, Nixon & Flowers' No. 1 W. J. Flowers ..... Rotary rig.

Miley and Marland Oil Co.'s No. 1 C. D. Read, C NW Sec. 12, Blk. 31, T. & P. Sur., T-1-N ..... Location.

Peer Oil Corp.'s No. 1 Read, C NW Sec. 39, Blk. 30, T. & P. Sur., T-1-N ..... Drilling 1,290 ft.

Texon O. & L. Co. and Marland Oil Co.'s No. 1 Mrs. Connaly ..... Top salt 1,425 ft.; drilling 1,620 ft.

Texon and Marland's No. 1 W. R. Settles, Lease A, C SW Sec. 134, Blk. 29, W. & N. W. Sur. ..... Drilling 700 ft.

HUDSPETH COUNTY

Lockhart Brothers' No. 1 Gardner & Moseley, C SE Sec. 5, School Blk. 21 ..... Shut down 262 ft.

Lockhart & Co.'s No. 1 Moore, C SE Sec. 16, Blk. 71, T. & P. Sur. T-6 ..... Spudded 100 ft. and shut down.

Lockhart & Co.'s No. 1 Gardner & Mosely ..... Rigging up.

IRION COUNTY

Cash Dollar et al's No. 1 G. J. Bird, NE Sec. 16, Blk. 10, S. P. R. R. Sur. ..... Shut down 2,500 ft.

JEFF DAVIS COUNTY

J. K. Hughes Dev. Co.'s No. 2 Means ..... Shut down 1,250 ft.

Humble O. & R. Co.'s No. 2 Crecencio Flores, 1,180 ft. N and 850 ft. E of SW cor. Sec. 34, Blk. 58, T. & P. Sur., Twp. 8 ..... Drilling 1,360 ft.

JONES COUNTY

Gibson & Johnson's (was Cole & Hart's) No. 1 Joe Dillard, NW cor. Sec. 2, Blk. 17, T. & P. Sur. ..... Hole full water 1,505-40 ft.; set 10-in. 1,545 ft.; shut-down orders 2,306 ft.

Midwest Exploration Co.'s (was Campbell et al's) No. 1 L. H. Herndon, Sec. 6, M. E. P. & P. Sur., elev. 1,832 ft. ..... Top pay 2,498 ft.; deepening to 2,524 ft.; swabbed 115 bbls.; shut down for orders 3,009 ft.

Garland & Diamond's No. 1 E. D. Glynn, SE cor. Sec. 18, Deaf & Dumb Asylum Lands ..... Seven bailers salt water per hour at 1,465-1,500 ft.; hole full water 1,900-07 ft.; fishing 2,430 ft. for tools.

Hutson & Weaver's No. 1-A Smith, Sec. 51, Blk. 18, T. & P. Sur. ..... Drilling 850 ft.

Marston Oil Co.'s No. 1 J. S. Swan, Robert Spears Sur. No. 280 ..... Hole full salt water 2,390-2,400 ft. and 2,435 ft.; hole full salt water 2,015-20 ft.; shut down 2,508 ft.

Phillips Petroleum Co.'s No. 2 J. C. Mason ..... Spudding.

W. G. Stough et al's No. 1 W. C. Bennett, Sec. 42, Orphan Asylum Sur. ..... Drilling 250 ft.

W. G. Stough and others' No. 1 J. P. Willis, J. C. Patterson Sur. No. 2 ..... Installing engine 1,740 ft.

Stebbins Oil Co.'s No. 2 Higgs, SE cor. Sec. 30, W. T. Scott Sur. ..... Location.

Stebbins Oil Co.'s No. 1 Scott ..... Drilling 490 ft.

Swensondale Oil Co.'s No. 1 Caton, SW NW Sec. 9, Deaf & Dumb Asylum Lands ..... Drilling 2,515 ft.

FOARD COUNTY

Clark et al's No. 1 Atkins ..... Drilling 1,725 ft.

Fain-McGaha Oil Corp. et al's No. 1 Mathews ..... Total depth 2,550 ft.; plugging back to produce from sand at 1,484-92 ft.

The Texas Company's No. 1 Watkins ..... Total depth 2,621 ft.; underreaming 8-in.

KNOX COUNTY

Deep Rock Oil Co.'s No. 1 Moore ..... Drilling 200 ft.

Deep Rock Oil Co.'s No. 1 Beavers, CSL Sec. 224, Blk. 44, elev. 1,441 ft. ..... Water sand 3,035-55 ft.; drilling 3,150 ft.

Deep Rock Oil Co.'s No. 1 Big Four, 1,270 ft. S and 2,590 ft. W of NE cor. Sec. 31, Blk. 4 ..... Drilling 2,450 ft.

LOVING COUNTY

Lockhart Brothers' No. 1 fee, Sec. 35, Blk. 33, H. & T. C. Sur. ..... Location.

Owens & Sloan's No. 1 W. D. Johnson, C SE Sec. 20, Blk. 53, T-2, T. & P. Sur., elev. 2,934 ft. ..... Shut down 1,020 ft.; in litigation.

LYNN COUNTY

Elpo Oil Co.'s No. 1 Nevols, NW cor. Sec. 6, Blk. C-42, School lands ..... Rotary; drilling 670 ft.

The Hart Oil Corp.'s No. 1 C. O. Edwards, NW NW Sec. 5, Blk. 3, L. & S. V. Sur. ..... Shut down 1,400 ft.

MIDLAND COUNTY

Orbit Oil Co.'s No. 1 Moreland, C SE Sec. 17, Blk. 39, T. & P. Sur. T-1-S ..... Shut down 185 ft.

MITCHELL COUNTY

Robert Thraves' No. 1 C. Way, Sec. 91, Blk. 27, T. & P. Sur. T-1-N ..... Total depth 2,508 ft.; shut down.

B. E. Walter et al's No. 1 J. E. Dollen, NW cor. SW Sec. 11, Blk. 27, T. & P. Sur. ..... Shut down 2,955 ft.; hole full sulphur water.

NOLAN COUNTY

Herbert Oil Co.'s (was McClesky and others') No. 1 Pepper, SE cor. SW Sec. 29, Blk. 22, T. & P. Sur. ... Rigged up and shut down.

Reiter-Foster Oil Co.'s No. 1 T. E. Arledge, Sec. 217, Blk. 1, H. & T. C. Sur. ..... Location.

Zweifel and others' No. 1 Longbotham, C SE Sec. 130, Blk. 1, H. & G. N. Sur. ..... Shut down 3,575 ft.

PECOS COUNTY

George Anderson et al's No. 1 McKenzie, C SE N half Sec. 6, Blk. 604 ..... Top salt 1,010 ft.; sulphur water 2,230 ft.; drilling 2,290 ft.

George Anderson's No. 1 Sherbine Brothers ..... Rig on ground.

Allsman & Bell's No. 3 Pecos River bed ..... Drilling 200 ft.

Allsman & Bell's No. 4 river bed, 325 ft. upstream from No. 3, between Secs. 71 and 61 ..... Moving in material.

Benedum & Trees' No. 1 J. C. Trees, C NW SE SE Sec. 30, Blk. 7, H. & G. Sur., elev. 2,556 ft. ..... Flowed sulphur water 2,250 ft.; shut down 2,460 ft.

Buell et al's No. 1 Batchelor, C N ½ NE Sec. 39, Blk. OW, G. C. & S. F. Sur., elev. 3,188 ft. ..... Show oil 1,700 ft.; flowed sulphur water 1,775 ft. and 2,800 ft.; shut down 2,905 ft.

California Co.'s No. 2 Yates, Sec. 34, Blk. 194. Elev. 2,502 ft. ..... Rig.

California Co.'s No. 3 Yates, Sec. 34, Blk. 194. Elev. 2,502 ft. ..... 1,000 ft. oil at 1,060-1,100 ft.; drilling 1,144 ft.

California Co.'s No. 4 Yates, Sec. 34, Blk. 194 ..... Top pay 1,023 ft.; drilling 1,052 ft.; flowed 150 bbls. per hour

California Co.'s No. 5 Yates, Sec. 34, Blk. 194 ..... Cementing 6-in. 990 ft.

California Co.'s No. 2 M. A. Smith, Sec. 35, Blk. 194 ..... Shut down 1,488 ft.

California Co.'s No. 3 Smith, Sec. 35, Blk. 194 ..... Rigging up.

Cummings et al's No. 1 Blackstone & Slaughter ..... New location.

Douglas Oil Co.'s No. 1 J. T. Sellman ..... Shut down 737 ft.

Day Bros. & McKnight's No. 1 Yates, NW cor. Sec. 58, Blk. 1 ..... Drilling 200 ft.

M. Z. Dibble & Hale's No. 1 Bonebrake, Sec. 115, Blk. 3, H. & G. W. Sur. Elev. 2,555 ft. ..... Shut down 640 ft.

Bob Elmore's No. 1 M. Holmes, Sec. 542, Blk. 1, L. & G. N. Sur., elev. 2,176 ft. ..... Top salt 335 ft.; slight show oil and 2 bailers sulphur water 1,500 ft.; small show gas at 1,515 ft.; shut down 2,010 ft.

Garland & Mott's No. 1 El Paso Cattle Loan Co., C NE Sec. 26, Blk. 126, T. & S. L. Sur., elev. 3,267 ft. .... Hole full sulphur water 2,560 ft.; drilling 3,080 ft.

George A. Henshaw et al's No. 1 B. T. Corder, cen. SW Sec. 74, Blk. 2, C. C. S. D. Sur. ..... Location.

George A. Henshaw, Jr., No. 1 Snyder, Sec. 29, Blk. 144, T. & St. L. Sur. Elv. 2,780 ft. ..... Drilling 100 ft.

Humble O. & R. Co.'s No. 1 M. A. Smith, NE cor. Sec. 36, Blk. 194, G. C. & S. F. Sur. Elev. 2,727 ft. ..... Top pay 1,425 ft.; began flowing 1,488 ft.; total depth 1,600 ft.; flowed 65 bbls. in 1 hour; pinched in.

Humble O. & R. Co.'s No. 2 Smith, Sec. 36, Blk. 194 ..... Crooked hole 135 ft.

Humble O. & R. Co.'s No. 3 Smith, Sec. 36, Blk. 194 ..... Rigging up.

Humble O. & R. Co.'s No. 1 Smith-B, SE cor. Sec. 101, Blk. 194 ..... Moving in material.

Kirby Oil Co.'s No. 1 W. W. Turney, NW cor SW Sec. 11, Blk. 140, T. & St. L. Sur. ..... Set 8-in. 1,052 ft.

Masda Oil Co. and Savoy Oil Co.'s No. 1 Smith, Sec. 34, Blk. 194, G. C. & S. F. Sur. ..... Top pay 1,470 ft.; drilling 1,500 ft.; 800 ft. oil.

Masda Oil Co. and Savoy Oil Co.'s No. 2 Smith, Sec. 34, Blk. 194, G. C. & S. F. Sur. ..... Location.

McMan and Marland's No. 6 I. G. Yates. Elev. 2,770 ft. .. Top pay 1,495 ft.; drilling 1,500 ft.

Mid-Kansas and Transcontinental Oil Co.'s No. 2 Smith-Taylor ..... Top pay 1,255 ft.; flowed 110 bbls. per hour at 1,374 ft.

Mid-Kansas and Transcontinental's No. 3 Smith-Taylor, Sec. 33, Blk. 194 ..... Rigging up.

Mid-Kansas and Transcontinental's No. 1 Mrs. M. A. Smith ..... Drilling 1,180 ft.

Mid-Kansas and Transcontinental's No. 4 Yates-B ..... Drilling 200 ft.

Mid-Kansas and Transcontinental's No. 8 Yates-A ..... Straightening hole 435 ft.

Mid-Kansas and Transcontinental's No. 1 Yates-D ..... Drilling 585 ft.

Moody Oil Corp.'s No. 1 B. T. Corder, cen. SW Sec. 77, Blk. 2, C. C. S. D. Sur. ..... Location.

Olean Petroleum Co.'s No. 1 G. N. Harral, CSW Sec. 82, Blk. R-2, G. C. & S. F. Sur. Elev. 3,005 ft. ..... Drilling 1,890 ft.

Quinby Oil Co.'s No. 1 Townsite, Sec. 1, Blk. 267, Client Addition Sur. Fort Stockton, elev. 2,980 ft. ..... Shut down 3,440 ft.

Quinby Oil Co.'s No. 2 Bennet, C NW 593, Blk. 105, G. C. & S. F. Sur., elev. 2,560 ft. ..... Shut down 1,457 ft.

Quinby Oil Co.'s No. 1 A. A. Gray, 660 ft. N and 1,320 ft. E. SW cor. Sec. 593, Abst. 3,009, Elev. 2,551 ft. .. Shut down 700 ft.

Red Bank Oil Co.'s No. 2 M. A. Smith, Sec. 24, Blk. 194 (330 ft. S of No. 1) ..... Spudding.

Roxana Petroleum Corp.'s No. 1 Smith-A, Sec. 37, Blk. 194 ..... Show oil 1,435-87 ft.; top pay 1,537 ft.; total depth 1,562 ft.; flowing 418 bbls.

Roxana Petroleum Co.'s No. 2 J. H. Tippett, Sec. 102, Blk. 194 ..... Location.

Simms Oil Co.'s No. 2 M. A. Smith, Sec. 103, Blk. 194. ... Drilling 280 ft.

Transcontinental Oil Co.'s No. 1 Blackstone & Slaughter, Sec. 29, Blk. 129, F. St. L. Sur. Elev. 3,539 ft. ..... 250 ft. sulphur water in black sand 1,150-80 ft.; small show oil 1,510 ft.; show gas 1,540 ft.; drilling 1,655 ft.

World Oil Co.'s No. 1 Kloh, Sec. 47, Blk. 48, Township 8, T. P. R. R. Sur. Elev. 3,310 ft. ..... Rig on ground.

World Oil Co.'s No. 1 Serf, SW cor. NE Sec. 10, Blk. 130, T. & St. L., elev. 3,245 ft. ..... Location.

PRESIDIO COUNTY

Headlock & Miller's No. 1 Tootle est., Sec. 123, Blk. 3, D. & P. Sur., elev. 2,912 ft. ..... Salt water 2,610 ft.; running 5-in. at 2,855 ft.; total depth 2,910 ft.; shut down for fishing tools.

Pinto Canyon Oil Co.'s No. 1 Fields, 1,760 ft. S & E NW cor. Sec. 74, Blk. 3, D. & P. Sur. ..... Location.

REAGAN COUNTY

Henshaw & Camp's No. 1 University, Sec. 14, Blk. 49, University Land, elev. 2,772 ft. ..... 250 ft. sulphur water at 800 ft.; shut down 810 ft.

Skelly Oil Co.'s No. 1 University, SW cor. Sec. 33, Blk. 3, University Land ..... Rig.

Texon O. & L. Co.'s No. 1-B University, Group 1 ..... Top pay 6,284 ft.; shut down for motor 6,590 ft. with 3,800 ft. of 38.7 gravity oil in hole.

White et al's No. 1 Shofner & Sterling, SE cor. NW Sec. 10, 2 miles north of Big Lake ..... New location.

Marland Oil Co.'s No. 1 University-Anderson, Sec. 19, Blk. 52, University Land ..... Location.

REEVES COUNTY

Exploration Co.'s No. 1 A. A. Kinney, 1,500 ft. W. of NE cor. Sec. 26, Blk. C-18, Public School Land. Elev. 2,847 ft. — Shut down for 15-in., 325 ft.
David R. Thompson's No. 1 A. A. Eddins — Shut down 1,322 ft.
World Oil Co.'s No. 1 Biggs, C SE Sec. 65, Blk. 112, Public School Land Sur., elev. 3,068 ft. — Shut down 1,610 ft.
World Oil Co.'s No. 1 Duff, elev. 2,753 ft. — Top Delaware lime 4,185 ft., shut down for orders 4,189 ft.

RUNNELS COUNTY

Kennedy et al's No. 1 J. E. Tally — Spudding 150 ft.
May et al's No. 1 J. M. Schneider, John Wall Sur. — Fishing 240 ft.
Miles Oil Co.'s No. 1 Charles Ray, Sec. 21, T. & N. O. Sur. — Cellar.
Miles Oil Co.'s No. 1 L. S. Lawhon, NE cor. Sec. 68, — Show gas 960-80 ft.; drilling 1,600 ft.
Noble O. & G. Co.'s No. 1 Sims, Sec. 12, J. J. McHenry Sur. — Hole full sulphur water 2,710-20 ft., total depth; underreaming 8-in.
Swensondale Oil Co.'s No. 1 E. A. Werner — Spudded 40 ft. and shut down for gas.
Owenwood Oil Corp.'s No. 1 H. B. Fowler — Location.

SCHLEICHER COUNTY

Beavers & Leath et al's No. 1 J. A. and W. T. Whitten, C NW Sec. 35, Blk. 11, T. O. Sur. — Shut down 400 ft.
Thomas Grey et al's No. 1 Ball Robinson, C NW Sec. 25, Blk. M, G. H. & S. A. Sur. — Sulphur water 2,125 ft.; hole full water 2,160-80 ft. and 2,935 ft.; shut down for orders 3,004 ft.

SCURRY COUNTY

J. B. Mims et al's No. 1 J. J. Koonsman, Sec. 220, Blk. 2, H. & T. C. Sur. — New location.

STERLING COUNTY

Orr et al's No. 1 Neal Reed, CNL Sec. 15, Blk. 30, W. & N. W. Sur. — Shut down 1,390 ft.

STONEWALL COUNTY

Peer Oil Corp. and Producers Oil Co.'s (was J. P. Johnson's) No. 1 R. P. Morrow — Shut down for 8-in. 2,560 ft.

TAYLOR COUNTY

A. J. Brown et al's No. 1 Henslee, NE cor. Sec. 5, Blk. 4, S. P. R. R. Sur. — Total depth 2,235 ft.; underreaming 8-in.
Dorning & Perrine's No. 1 J. A. Hammer, C N 100 acres, Sec. 23, Blk. 19, T. & P. Sur., elev. 1,904 ft. — Shut down 455 ft.
Gilbert Johnson and Day Brothers' No. 1 C. M. Brown, Sec. 1, Blk. 6, T. & P. Sur. — Spudded and shut down; installing engine.
Owen & Sloan's No. 1 Lattimer, Sec. 14, Blk. 9, T. & P. Sur. — Fishing 2,605 ft.
Rosser & Pendleton's No. 1 Sam Hutman, C W ½ NW Sec. 64, Blk. 5, T. & P. Sur. — Water sand 2,222 ft.; drilling 2,630 ft.

TERRY COUNTY

Kingsland Oil & Potash Co.'s No. 1 Brownsfield, C NW SW SW Sec. 7, Blk. 1-A, E. L. R. R. Sur. — Slight show gas 2,230 ft.; drilling 3,280 ft.

TOM GREEN COUNTY

George Amery's No. 1 Wilkey, C SW Sec. 3, B. A. L. Sur. — Location.
Cox et al's No. 1 Llano — Shut down 306 ft.
Fitzgerald et al's No. 1 Bennett — Running 8-in. 1,385 ft.
Mariand Oil Co.'s No. 1 J. W. Johnson, C SE, Sec. 6, R. B. Sanderson Sur. — New location; building rig.
Tulsa Oil Co.'s No. 1 Adams, C SW Sec. 162, Blk. 11, S. P. R. R. Sur. — Shut down 735 ft.

UPTON COUNTY

Eastland Oil Co. and Brandon & McCamey's No. 1 Union Land — Moving in material.
Mark Curtis et al's (was Hultz et al's) No. 2 Giddings, 5,336 ft. S and 6,678 ft. E of NW cor. Throckmorton Co. School Land, League 1. Elev. 2,757 ft. — Spudded and shut down.
J. M. Hickey's No. 1 W. I. Gormley, 1,650 ft. from SW and SE lines Sec. 7, Blk. 36, H. & T. C. Sur. Elev. 2,274 ft. — Top salt 472 ft.; set 8-in. 1,775 ft.; small show gas; show of sulphur water at 2,195 ft.; plugging to abandon.
Texas Co. & Cordova Union's No. 1 Union Land, Sec. 23, Blk. 35, H. & T. C. — Location.
R. H. Paxton's No. 1 J. T. Lane, Sec. 3, G. C. & S. F. on Orient right of way — Top salt 478 ft.; drilling 650 ft.
Wise & Jackson's No. 1 J. H. Porter, SW cor. SW SW Sec. 184, Blk. E. Elev. 2,592 ft. — Top salt 1,370 ft.; top lime 3,379 ft.; top pay 3,419 ft.; total depth 3,517 ft.; shot 150 qts. at 3,414-3,508 ft.; 300 ft. oil in hole before shot; now 900 ft. sulphur water and 300 ft. oil; shut down.

VAL VERDE COUNTY

A. Blume et al's No. 1 Moore est., Sec. 183, J. Mitchell Sur., elev 953 ft. — Shut down 3,000 ft.
Curso Williams' No. 1 Holman, NE NE Sec. 5, Blk. N, G. H. & S. A. Sur. — Shut down 2,940 ft.
Douglas Oil Co.'s No. 1 Sellars, C SE Sec. 82, Blk. A, I. & G. N. Sur. — Shut down 3,500 ft., contract depth.
East Del Rio Oil Co.'s No. 1 Russell, SE cor. Sec. 183, Del Rio Town Sur. Elev. 941 ft. — Total depth 3,190 ft.; shut down.
Magnolia Petroleum Co.'s No. 1 Whitehead, Sec. 81, D. G. C. & S. F. Sur., elev. 1,770 ft. — Set 6-in. 3,525 ft.; drilling 4,300 ft.
Independent Operators' No. 1 Whitehead, SE SE Sec. 80, Blk. 4, I. & G. N. Sur., elev. 1,175 ft. — Shut down 3,900 ft.
O. O. Owens' No. 1 Mills, Sec. 128, Blk. 1, I. & G. N. Sur., elev. 2,130 ft. — Gas sand 2,491-2,520 ft.; tested 125,750 ft. gas; reset 8-in. 2,511 ft.; shut down 2,680 ft. (corrected).

WINKLER COUNTY

Amerada Petroleum Corp.'s No. 1 J. B. Walton, SW cor. NW Sec. 48, Blk. 26 — Cementing 12-in. 182 ft.
Atlantic O. P. Co.'s No. 1 Ida Hendricks, SE cor. W ½ NE Sec. 44, Blk. 26 — Drilling 1,960 ft.
Atlantic O. P. Co.'s No. 1 Grisham-Hunter, Sec. 34, Blk. B-5, Elev. 2,823 ft. — Shut down 2,522 ft.
Atlantic O. P. Co.'s No. 2 Grisham-Hunter — Cementing 12-in. 190 ft.
Atlantic O. P. Co. No. 1 Grisham-Hunter-C (was Lemar) — Drilling 650 ft.
Atlantic O. P. Co.'s No. 1 Ida Hendrick-D — Building rig.
G. M. Church et al's No. 1 Ida Hendrick, Sec. 29, Blk. B-5 — Drilling 650 ft.
Cranfill Brothers' and California Co.'s No. 1 M. J. Bashara, at cor. Secs. 10, 11, 22 and 23, School Blk. 77 — Fishing cones 2,806 ft.
Cranfill & Reynolds' No. 1 Ida Hendrick, C SW NW NW Sec. 28, Blk. B-5. Elev. 2,814 ft. — Top salt 1,290 ft.; top lime 2,487 ft.; about 3,000,000 ft. gas at 2,660-70 ft.; increase 2,700 ft.; drilling 2,780 ft.
Cranfill & Reynolds' No. 2 Ida Hendricks — Top salt 1,271 ft.; drilling 2,360 ft.
Cranfill & Reynolds' No. 1 Grisham-Hunter-A — Location.
Eastland Oil Co. and Arnold's No. 1, Sec. 35, Blk. B-5 — Spudding.
Group 1 Humble O. & R. Co.'s No. 1 T. G. Hendricks, C SE Sec. 36, Blk. 37, elev. 2,823 ft. — Top salt 2,120 ft.; top lime 3,095 ft.; hole full sulphur water 3,222-58 ft.
Humble O. & R. Co.'s No. 1 T. G. Hendricks, NW cor. NE Sec. 34, Blk. B-5, Public School Land, elev. 2,816 ft. — Pocket of gas at 2,500 ft.; blew tools out through rig; estimated 5,000,000 ft. gas; shut down 2,763 ft.; gas increased from 8,000,000 to 15,000,000 ft.; fishing bit.
Humble O. & R. Co.'s No. 2 T. G. Hendricks, SE cor. NE Sec. 34, Blk. B-5. Elev. 2,824 ft. — Top salt 1,340 ft.; 20,000,000 ft. gas 2,385-90 ft.; 55,000,000 ft. gas 2,540 ft.; shut down for orders.
Humble O. & R. Co.'s No. 3 Hendrick, Sec. 34, Blk. B-5... — Top salt 1,362 ft.; setting 8-in. 2,192 ft.
Humble O. & R. Co.'s No. 4 Hendrick, Sec. 34 — Top salt 1,385 ft.; drilling 1,545 ft.
Humble O. & R. Co.'s No. 5 Hendrick, Sec. 34, Blk. B-5... — Building rig.
Independent O. & G. Co.'s No. 1 J. S. Howe-D, NE cor. W ½ SE Sec. 44, Blk. 26 — Shut down 810 ft.; losing rotary returns.
Independent O. & G. Co.'s No. 1 Hendricks-A, elev. 2,816 ft. — 250,000 ft. gas 2,555-75 ft.; set 8-in. 2,595 ft.; drilling 2,677 ft.
Independent O. & G. Co.'s No. 2 Hendricks-A, elev. 2,822 ft. — Drilling ahead 2,504 ft.
Independent O. & G. Co.'s No. 1 Vardeman-B — Building rig.
Liner Drilling Co.'s No. 1 Seth-Campbell, NE cor. Sec. 2, Blk. B-5 — Drilling 450 ft.
Landreth Prod. Corp.'s No. 2 Grisham-Hunter, SE cor. W ½ NW Sec. 45, Blk. 26 — Top salt 1,830 ft.; top lime 2,490 ft.; shut down 2,506 ft.
Landreth Prod. Corp.'s No. 1 Hendricks-A, SE cor. SW Sec. 29, Blk. B-5 — Top lime 2,663 ft.; show oil 2,688 ft.; drilling 2,725 ft.
Landreth and Roxana's No. 2 Ida Hendrick-A, Sec. 29, Blk. B-5 — Rigging up.
Landreth and Roxana's No. 3 Ida Hendrick-A, Sec. 29, Blk. B-5 — Building rig.
Landrith & Roxana's No. 4 Ida Hendrick-A — Building rig.
Mariand Oil Co.'s No. 1 Grisham-Hunter — Location.
Mariand Oil Co.'s No. 2 Grisham-Hunter — Top salt 1,277 ft.; total depth 2,402 ft.; drilling by 5-in. drill stem.
Mariand Oil Co.'s No. 3 Grisham-Hunter — Top salt 1,225 ft.; standardizing 2,427 ft.
Mariand Oil Co.'s No. 4 Grisham-Hunter — Setting up rotary.
Mining & Engineering Co.'s No. 1 T. G. Hendricks, Sec. 10, Blk. B-12 — Building rig.
R. S. Matthews et al's No. 1 State, C Sec. 7, Blk. A-57, Public School Land Sur. Elev. 3,128 ft. — Top salt 1,623 ft.; shut down 3,500 ft.; contract completed.
Murchison Oil Co. and Cranfill Brothers' No. 2 Grisham-Hunter — Location.
Murchison Oil Co. and Cranfill Brothers' No. 3 Grisham-Hunter — Top salt 1,260 ft.; drilling 2,420 ft.
Murchison Oil Co. and Cranfill Brothers' No. 4 Grisham-Hunter — Location.
Murchison Oil Co. and Cranfill Brothers' No. 1 Grisham-Hunter-B, Sec. 35, Blk. B-5 — Top lime 2,309 ft.; 10,000,000 ft. gas at 2,465 ft.; mudded off; drilling 2,500 ft.
Pure Oil Co.'s No. 2 Hendricks, elev. 2,827 ft. — Top salt 1,015 ft.; top lime 2,390 ft.; made 20-bbl. head at 2,635-43 ft.; 1,200 ft. oil in hole 2,657-80 ft. shut down.
Pure Oil Co.'s No. 3 Hendrick, NE cor. SW Sec. 41, Blk. B-5 — Rigging up.
Pure Oil Co.'s No. 1 Hendricks-B, NE cor. SE, Sec. 34, Blk. B-5 — Show gas 2,350-60 ft.; show oil 2,380 ft.; drilling 2,450 ft.
Pure Oil Co.'s No. 2 Hendricks-B — Top lime 2,387 ft.; standardizing 2,387 ft.
Pure Oil Co.'s No. 3 Hendricks-B — Drilling 250 ft.
Pure Oil Co.'s No. 4 Hendricks-B — Location.
Republic Prod. Co.'s No. 1 Grisham-Hunter-A, NW cor. E ½ SW Sec. 45, School Block 26 — Top lime 2,125 ft.; some gas; cementing 8-in. 2,121 ft.
Republic Prod. Co.'s No. 1 Grisham-Hunter-B, SW cor. E ½ SE Sec. 41, Blk. B-5 — Top salt 1,300 ft.; 10,000,000 ft. gas 2,125 ft.; total depth 2,170 ft.; shut in with 2,000 ft. drill stem in hole.
Republic Prod. Co.'s No. 2 Grisham-Hunter-B — Rigging up.
Roxana Petroleum Corp.'s No. 1 Grisham-Hunter-A, SW cor. E ½ NW Sec. 45, School Block 26 — Top lime 2,428 ft.; little gas; cemented 8-in. 2,426 ft. and shut down.
Roxana Petroleum Corp.'s No. 1 Grisham-Hunter-B, SW cor. S ½ SE Sec. 29, Blk. B-5 — Top lime 2,657 ft.; show oil and gas 2,630 ft.; straightening hole 2,682 ft.
Roxana Petroleum Corp.'s No. 2 Grisham-Hunter-B, NW cor. S half SE Sec. 29, Blk. B-5 — Rig.
Roxana Pet. Corp.'s No. 1 Grisham-Hunter-C — Top salt 1,340 ft.; drilling 1,761 ft.
Roxana Petroleum Corp.'s No. 1 Grisham-Hunter-D, SW cor. S half NE Sec. 41, Blk. B-5 — Rigging up.
Roxana Petroleum Corp. and Llano Oil Co.'s No. 1 Scarborough, C Sec. 1, Blk. C-22, Public School Land, elev. 2,921 ft., top lime 3,132 ft. — Total depth 3,447 ft.; hole full sulphur water; plugged back to 3,347 ft.; shot 180 quarts 3,105-3,295 ft.; swa bed 70 bbls.; shot 80 quarts 3,047-3,127 ft.; bridged at 2,700 ft.; cleaning out and swabbing.
Sheldon & Burden's No. 1 Ida Hendrick, SW cor. SE Sec. 28, Blk. B-5 (10-acre tract) — New location.
Southern Crude Oil Pur. Co.'s No. 3 T-67 Hendricks-C, SE cor. NE Sec. 33, Blk. B-5, elev. 2,816 ft. — Top salt 1,870 ft.; little gas 2,620-40 ft.; shut down for orders 2,735 ft.; making 2,000,000 ft. gas and 1 bbl. oil; top lime 2,630 ft.
Southern Crude Pur. Co.'s No. 4 T-67 Hendricks-C. Elev. 2,810 ft. — Cemented 8-in. 2,525 ft.; small show oil and gas 2,660-65 ft.; gas increased 2,689-90 ft.; estimated 3,000,000 ft. gas 2,720 ft.; 1½ bbls. oil 2,735-40 ft.; shut down
Southern Crude Oil Pur. Co.'s No. 2 Ida Hendrick T-88-B — Cementing 10-in. 375 ft.
Southern Crude Oil Pur. Co.'s No. 1-F Hendricks, Sec. 33, Blk. B-5, NE cor. SE — Cemented 6-in. 2,529 ft.; standardized and shut down.
Southern Crude Oil Pur. Co.'s No. 1 T-89 Grisham-Hunter-A, CWL NE SW Sec. 35, Blk. B-5. Elev. 2,816 ft. — Top salt 1,219 ft.; top lime 2,294 ft.; 10,000,000 ft. gas 2,479-75 ft.; 3,000,000 ft. increase at 2,485 ft.; drilling up iron at 2,555 ft.
Texon O. & L. Co.'s No. 2 Grisham-Hunter-A — Top salt 1,390 ft.; drilling 2,185 ft.
Texon O. & L. Co.'s No. 3 Grisham-Hunter-A, NW cor W half SE Sec. 41, Blk. B-5 — Rig.
Texon O. & L. Co.'s No. 1 Grisham-Hunter-B, NW cor. W ½ SW Sec. 45, School Block 26 — Running 10-in. 850 ft.
Texon O. & L. Co.'s No. 2 Grisham-Hunter-B — Spudded and shut down.
White Eagle O. & R. Co.'s (was Gibson & Johnson's), No. 1 R. A. Lock, 1,320 ft. W of NE cor. Sec. 30, Blk. 74, NW of discovery well, elev. 2,830 ft. — Drilling 2,700 ft.
Southern Crude O. P. Co.'s No. 1 Ida Hendrick 3-T-67-A, C SW NW NE Sec. 4, Blk. B-12, elev. 2,784 ft. — Top lime 2,638 ft.; drilling 3,100 ft.; no oil.
Southern Crude Oil Pur. Co.'s No. 2 Ida Hendrick 3-T-67-A — Top salt 1,525 ft.; drilling 1,938 ft.
Southern Crude O. P. Co.'s No. 1 T-67 Hendrick-B, NE cor. SE Sec. 44, Blk. 26 — Top salt 2,210 ft.; top lime 2,645 ft.; standardizing 2,648 ft.
Tidal Oil Co.'s (was L. D. Ladd et al's) No. 1 J. W. Amburgey, C Sec. 24, Blk. B-7, Public School Land Elev. 2,992 ft. — Top salt 1,220 ft.; one-half baller sulphur water per hour 4,300 ft.; drilling 4,410 ft.
Southern Crude O. P. Co.'s No. 1 Hendrick 3-T-68-A, SW cor. W ½ NW Sec. 35, Blk. B-5 — Top salt 1,365 ft.; top lime 2,300 ft.; standardizing 2,313 ft.
Southern Crude O. P. Co.'s No. 2 T-88 Hendricks-C, Sec. 28, Blk. B-5 — Top salt 1,260 ft.; drilling 1,770 ft.
Southern Crude O. P. Co.'s No. 2 Hendrick 3-T-68-A — Cementing 2,288 ft.
Southern Crude O. P. Co.'s No. 3 Hendrick 3-T-68-A — New location; moving in rig.
Southern Crude O. P. Co.'s No. 1 T-88 Ida Hendricks-C, NW cor. Sec 28, Blk. B-5 — Standardizing 2,420 ft.
Turman & Maxwell's No. 1 Ida Hendrick — Top salt 1,225 ft.; drilling 1,380 ft.

SURVEY OF PETROLEUM SITUATION ABROAD

(Continued from Page 39)

refining industry. The Consortium has promised immediate aquisition of the refinery of Sabadell y Henry in Barcelona, which it proposes to enlarge and put under maximum production within six months. Other refineries and plants are to be established at Tarragona, Santander, Seville, Coruna and Vigo. In respect to transportation this group proposes to construct seven 7,600-ton and two 4,000-ton tankers. The larger fleet of seven would have an annual capacity of 320,000 tons from American ports, while the two smaller vessels would suffice for the annual transport of 96,000 tons from Black Sea ports to Seville where the refining of European oils is to be centered. No details are available as to the individual sources of supply of crude and refined products.

A curious fact is noted, in this connection, that prices much lower than those current are guaranteed, these based on Gulf port quotations. The options on European Black Sea oils were pointed out as being at higher prices than options from Gulf producers, especially when the quality of products was compared. The final decision of the Spanish government in awarding the concession is awaited with interest. The difficulties attendant upon taking over all foreign-owned oil properties, largely American and British, is bound to lead to trouble when it comes to appraise values for reimbursement to the present owners.

Poland

The total production of crude oil in Poland during the three months ending June 30, 1927, amounted to 183,006 metric tons with a monthly production of 59,423 tons during April, 62,517 tons during May, and 61,066 tons during June.

During the second quarter of 1927, the number of producing wells increased by 18 over the number producing during April, although during May the decrease over April amounted to eight wells. During June the number was greater than the number producing in June, 1926. Average daily production during the last month of the quarter was 981 kilograms.

The following table contains an interesting comparison of the three months of the second quarter of 1927 with June, 1926, regarding the number of oil wells in Poland:

Months, 1927—	Number of wells— Drlg.	Active
April	192	2,446
May	191	2,438
June	219	2,464
June, 1926	208	2,322

Colombia

In Colombia, considerable misgivings are noted with respect to the contract now being negotiated by H. F. Yates, formerly of the Anglo-Persian Oil Co., and the Colombian government. This contract is reported to convey to Yates for 50 years an indefinite area from 2,500,000 to 6,000,000 acres on the boundary of Panama with all exploration rights and includes port developments, railroads, etc. From the few facts now at hand it is impossible to predict the probable outcome of these negotiations. Brazil and Argentina continue to discuss nationalization of their respective petroleum industries.

Peru

On October 6, the Peruvian senate approved the Deputies bill providing a 10-centavos per gallon gasoline consumption tax. The necessary endorsement has been assured and this law supersedes all former monopoly plans.

Rumania

Little change has been noted in the Rumanian oil industry. In September, the Romano-Americana (Standard Oil of New Jersey) brought in a well in the Moreni Field that is flowing from 750 to 800 metric tons per day. This well came in at 4,300 feet. The average depth of Rumanian oil wells has increased during the past five years from 850 to 1,000 meters. The only oil produced in Rumania today that is paying the cost of production is that obtained from flowing wells and since 80 per cent of Rumanian oil is from pumped or bailed wells the condition of the industry is far from encouraging. The cost of drilling has increased to approximately $80,000 for a 4,000-foot well.

AMERICA'S POLICY ON EXPORTS OF OIL

(Continued from Page 38)

trol of rubber and tin, Brazilian coffee valorization, all offer outstanding successful examples of what might be accomplished with this form of modern organization.

All effective commercial competition to United States petroleum interests abroad is centralized in two world-wide coordinated organizations, Royal Dutch Shell combination and Anglo-Persian Oil Co., both strongly supported and intimately connected with the foreign offices of the British and Netherlands Governments.

Again, there is a general tendency throughout the world to state control of the petroleum industry. Russia, Mexico, Rumania and Poland have attempted to nationalize production. France, Greece, Italy, Turkey, Ceylon and Australia have in fact or contemplation a form of government control of domestic prices.

Effective opposition to these conditions can be successfully consummated only by a counter-organization of similar weight and force such as is not now in existence in the American petroleum industry and for which the Webb Export Trade Act was especially created.

Regulation of Exports

A Webb Export Trade Act corporation for the regulation of petroleum exports, and including sufficient membership as to fairly represent a sizeable factor in this trade would accomplish these results:

1. Co-ordinated organized opposition by American petroleum interests to the commercial competition of foreign organizations in both sales and production of petroleum products abroad now opposed entirely by individual effort.

2. Effective counter-defense to formation of foreign state sales or production monopolies as well as restrictive policies now practiced by certain governments.

3. Stabilization of international market for all petroleum products at prices entirely economic and with some relation to the future petroleum requirements of the United States.

4. Forced participation or partial control of Russian petroleum exports thus eliminating one of the most disturbing factors in European and far eastern markets.

5. By enabling accurate estimates of export requirements to be prepared in advance, this proposed organization would indirectly exert economic back pressure on the domestic industry thus preventing disastrous and wasteful periodic export dumping and in turn stimulating more intelligent consideration involving the balance between domestic production and consumption.

None of the above would be immediately or absolutely achieved but are an indication of the outstanding benefits to be derived from the continuous functioning of a co-operative export corporation for United States petroleum products.

It so happens that the outstanding group now enjoying some 80 to 90 per cent of American export trade in petroleum products also controls approximately this same percentage of foreign crude oil production in American hands. It is only logical to assume that once amicably associated for co-operative efforts in export trade this same group would allocate foreign producing territories for exploitation and development to individual members of the group and thus eliminate costly competition for foreign petroleum properties among themselves.

HAS THE TURNING POINT BEEN REACHED?

(Continued from Page 38)

in 1924, 1925 and 1926, 41 per cent of all the completions were dry. In Montana during the same period (not including the Sunburst Field) 59 per cent of all the wells drilled were dry. Colorado, outside of proven fields, during the same period had a net result of 54 per cent dry. New Mexico, outside of the Artesia Field in Eddy County, yielded 51 per cent of failures during the aforementioned three-year period.

Demand Continues to Increase

The demand for petroleum products continues to increase from year to year. The United States is consuming 1,000,000 bbls. of gasoline per day. Consumption of this product on the Pacific Coast this year is more than 2½ times the demand of five years ago. A few years ago students of economics were predicting that the saturation point in the ownership of motor cars would soon be reached. It seems never to arrive and as the automobile grows in numbers the consumption of gasoline keeps pace. One of the captains of the automobile industry recently stated that the number of automobiles in the United States would double during the next 10 years. It is difficult to imagine such an increase and yet, using the number of cars in California as an index, the prediction will probably come true. In any event it is evident that the oil industry faces no threat of a diminishing demand for its principal product.

The increase in the demand for "furnace oils" will probably be greater than we experienced in the demand for gasoline.

Gasoline stocks on August 31, as indicated by the United States Bureau of Mines were lower (measured in number of days of supply) than at any time for several years. It is generally admitted that the daily production of petroleum in Kansas and Oklahoma will show a steady decline until at the end of the year it will be 150,000 bbls. per day less than at the present time. In as much as this quality of crude produces on an average of twice as much gasoline per barrel as that of any other major field it will be admitted that the situation looks very promising for 1928. It is the opinion of the writer that long before any action can be taken at Washington the excess of production over demand will be a condition of the past. It will require great individual effort to keep pace with the increasing requirements.

ENGINEERS CONSIDER GAS UTILIZATION

(Continued from Page 37)

either as disseminated free gas or absorbed at the fluid solid interfaces, or both. It seems unlikely, it was asserted, that these conditions once destroyed by the escape of gas and oil, can be restored by restoring a part of the gas.

Three Basic Propositions

All the engineers who were questioned following the submission of the reports by the regional chairman affirmed their belief in these three basic propositions:

First, assuming the high importance attached by this meeting to the principle of gas conservation to produce oil, it follows that experience in the particular pool or in relation to a particular property or well will develop the method to be applied to conserve gas to its fullest efficiency to produce oil.

Second, it follows that if the lessee on adjacent lands anywhere in the pool does not observe the practices known to be proper, such acts on their part will actually deprive the operators willing to follow the practice of part of the oil which they might ultimately recover.

Third, while our knowledge upon the subject at the moment may not be sufficiently comprehensive to demonstrate the particular gas conservation method or methods which should be employed, it is true that there are certain practices of the industry at present in relation to gas which have the effect of depriving adjacent lessee or lessees in the pool of the opportunity ultimately to recover as much oil as they would if these practices were not being followed.

Co-operative Working System

Discussion, brought about by further questions growing out of these basic propositions, revealed diversity of view in several respects. The discussion disclosed among other things that one of the objectives sought by the committee of seven is a workable system of co-operation among operators in the same pool. Another thing sought was a form of contract or agreement among such operators as would be satisfactory to all of them and at the same time embody the improved production practices now available as a result of the conservation committee's work. The question, "can a contract for unit operation be drawn that will give effect to the information developed by this committee?" elicited a variety of answers. A belief, several times expressed, was that while it probably would be impossible to incorporate specific drilling and production practices in a contract for a pool, principles could be embodied which would meet the more pressing demands of the situation and that details could be left to the determination of an impartial committee or umpire. It was recognized that it would be next to impossible to impose rules in a pool contract in advance of development of the pool when nobody knew what peculiar conditions might be encountered in the field.

A question asked repeatedly and evoking various answers was "can a well be drilled and allowed to flow without changing the quantity and character of the oil in the neighborhood land?"

When this question was answered in the negative, as it usually was, it was followed by this companion question, "What course would you want an operator on a neighboring lease to follow to cause the least change in the character and quantity of oil under your land?" The substance of several replies to this was, "I would want him to make the least possible use of gas and of gas energy and I would expect to do the same. This course would cause my neighbor no loss, and we both would gain in the ultimate recovery of oil."

In the discussion of spacing of wells one view expressed was that this is a matter of balance sheet only, a question of cost and profits. It might be best to drill a well in each quarter of an acre of ground, since the shorter the distance the oil must traverse to reach the well, the smaller the amount of gas energy expended.

Will Analyze Reports

A summary of the reports of the regional chairmen and of the discussions will be placed in the hands of the committee of seven for analysis and study, as a basis for the committee's conclusions to be given to the Board of Directors of the American Petroleum Institute at the Institute's annual meeting next December.

Immediately after adjournment of the conservation committee, the committee of seven, some of whose members had sat through the sessions Monday and Tuesday, began a series of conferences which were to last several days.

The committee of seven on the prevention of waste of gas is as follows: E. W. Marland, Marland Oil Co., chairman; Sid Keoughan, Continental Oil Co., Denver; Henry McGraw, Gypsy Oil Co., Tulsa; W. S. Farish, Humble Oil & Refining Co., Houston; J. Edgar Pew, Sun Oil Co., Dallas; and L. P. St. Clair, Union Oil Co. of California, Los Angeles.

Many of the technicians who attended the sessions here left tonight for Fort Worth, Tex., to attend the midyear meeting of the Petroleum Division, American Institute of Mining and Metallurgical Engineers.

LITTLE CHANGE IN REFINERY MARKETS

(Continued from Page 36)

this in mind. Special stabilized gasolines are being furnished by natural gasoline manufacturers to permit a blend containing a greater amount of natural gasoline, without making the final blend too volatile to handle economically or cause a gas lock in the carburetor.

Antiknock Gasoline

With the question of antiknock fuels being more generally discussed by the jobbers and public, refiners are faced with having to decide on some method of meeting this demand. In some cases the demand for antiknock gasolines has threatened the sales volumes of the re-

finers not particularly stressing this feature in their gasoline. Just what momentum this demand will gain over next year is problematical but it is pretty well conceded that high-compression motors will be produced in greater quantities and the need for antiknock gasolines will have a natural increase.

It is possible that radical changes in motor design may allow for higher compression and still use the regular grades of gasoline but the extent of this possibility seems very limited at present. If certain changes in the design do allow higher compression ratios it might be possible to use still higher compression ratios when supplied with an antiknock gasoline. Along with the fuller appreciation of antiknock gasolines on the part of the public and the actual need for these in certain cars, it might be necessary for refiners to guarantee a certain benzol equivalent on their gasoline. In effect this will mean more grades of gasoline and new prices. At present countless marketers are advertising antiknock gasolines which have relatively little antiknock value. The fact that a large amount of natural gasoline has been blended into the gasoline, or the product is a cracked gasoline or the volatility is high, has led marketers to feature them as antiknock fuels and they have generally demanded a premium.

In many cases this premium is fully justified but the practice of charging 2 or 3 cents for gasoline which does not yield better performance will be short lived. With a period of keen competition ahead, when volume promises to mean so much, this practice appears to be a short-sighted one. It has been said the public will be the biggest factor in deciding the design of both the motor car and the gasoline of the future and performance will be the thing sought in both so the question will gradually solve itself. The present seems to be the logical time to prepare to meet that demand through research, on the part of the refiner.

Gasolines and Naphthas

With plenty of low endpoint gasoline available, prices on this general class of material were fractionally lower, the 375 endpoint grade selling at 6¾ cents and the 400 endpoint grade at 6½ cents. The demand for all grades of gasoline fell of slightly and this fact, coupled with continued high rate of production seemed to threaten prices in general. But as has been stated before, 6 cents seems to be set as the bottom and is justified by the fact that at that price the refinery operations will just about break even free of overhead, depreciation, taxes and other indirect charges.

Refiners are forced to ignore these indirect charges. These would occur whether the plant ran or was shut down so these are not as great a factor in deciding the operation of the plants as the direct operating costs. If the return from operation is not sufficient to pay the direct costs then the only alternatives are to shut down the plant or curtail operations to a minimum.

Natural Gasolines

The general market for natural gasoline was fairly strong with the domestic demand taking the increased production, leaving no excess material. Grade A was stronger and generally demanded an eighth cent higher price. The Gulf Refining Co. was inquiring for additional quantities of this material for export and was expected to purchase several hundred cars.

Kerosene and Distillates

The 41-43 grade advanced one-eighth cent as a result of the increased domestic demand and limited production. This limited production has come about through the voluntary setting of certain specifications on the part of refiners and the manufacture of high-grade furnace oil. When gravity was the principal specification on kerosene, there was little attention paid to the distillation range and heavy naphtha and light gas oil could be included in the normal kerosene cut when prices justified this.

But many refiners have adopted a burning test specification or a maximum endpoint or some other specification that limits the amount of heavy material that may be included in the cut so it is not possible to increase the kerosene cut materially without reducing the quality standard. For this reason, kerosene prices have been generally higher over the past three years, considering the lesser differential being maintained between gasoline and kerosene.

Gas Oil and Fuel Oil

Gas oils and fuel prices remained unchanged over the week, although a slightly better demand was apparent for gas oils while fuel oil was offered freely. The lower cold test gas oils and fuels were in greater demand as a result of the increased buying of these for use in domestic burners and for heating offices, etc.

Lubricants and Wax

The lesser demand occasioned by the natural seasonal decline in consumption made the lubricating oil market soft and refiners were allowing small concessions to get the business. Bright stock appeared particularly weak with prices from 1 cent to one-half cent lower.

Wax continued strong with prices an eighth of a cent higher. One refiner is expecting a 3-cent market on wax before the close of the month and is storing a portion of the production in anticipation of this rise.

STANDARD N. J. MEN ON TOUR OF INSPECTION

A party of officers and directors of the Standard Oil Co. of New Jersey, including George H. Jones, chairman of the board; Charles G. Black, W. S. Farish, president of the Humble Oil & Refining Co.; Chester H. Swain, S. B. Hunt, E. J. Sadler and E. P. Salisbury made a tour of inspection of the Seminole, Okla., Field Sunday and Monday and from Seminole went to West Texas, where they will study the potentialities of that big oil area. They will be back in New York the last of the week.

NORTH AND WEST TEXAS

(Continued from Page 47)

mated good for 5 bbls. at 505-25 feet. Shaw & Rathke's No. 2 Cullers swabbed 150 bbls. and made 100 bbls. through tubing with packer at 1,997-2,005 feet. Tedford Brothers No. 3 Richards & Lanier was estimated good for 10 bbls. at 485-95 feet.

Montague County

Humble Oil & Refining Co.'s No. 1 Hinton was an 80-bbl. well at 789-805 feet.

Wichita County

Magnolia Petroleum Co.'s No. 135 Reilly made 65 bbls. initial from sand at 1,326-32 feet, total depth 1,337 feet.

Wilbarger County

Consolidated Oil Co. and J. S. Cosden's No. 1 Waggoner-B was abandoned as dry at 1,412 feet. Smith & Brady's No. 1 Waggoner swabbed 125 bbls. the first 18 hours at 2,301-13½ feet, total depth 2,314 feet. Waggoner Refining Co.'s No. 2 Waggoner-C pumped 40 bbls. from lime at 2,283-97 feet and broken sand 2,317-37 feet, total depth 2,348 feet.

Wise County

Orbit Oil Co.'s No. 1 Fred Milligan was dry and abandoned at 735 feet.

Young County

Wichita Production Co.'s No. 1 Hamilton was a dry hole at 1,100 feet. Hines & Whatley's No. 1 Criswell made one head of 30 bbls. from sand at 2,982-89 and 2,997-3,001 feet and was testing.

E. C. Stovall's No. 5 fee was completed for 60 bbls. at 4,243-86 feet, total depth 4,295 feet; No. 7 was completed at 4,336 feet, making 30 bbls. from lime at 4,260-4,330 feet; and No. 8 swabbed 10 bbls. from pay at 3,901-4,065 feet.

NORTH CENTRAL TEXAS AND WEST TEXAS

ESTIMATED DAILY PRODUCTION

Week Ending October 15, 1927

	Prod.
Ranger District—	
Brown County	20,988
Callahan County	4,512
Coleman County	1,147
Comanche County	1,461
Palo Pinto County	449
Ranger	8,457
Shackelford County	5,043
Stephens County	8,959
Total Ranger district	51,016
Decrease	120
Wichita Falls District—	
Archer County	23,717
Baylor County	87
Clay County	555
Cooke County	6,017
Jack County	883
Montague County	10,300
Throckmorton County	1,264
Wichita County	28,719
Wilbarger County	10,973
Young County	11,719
Total Wichita Falls district	94,234
Decrease	1,533
Total North Central Texas	145,250
Decrease	1,653
West Texas District—	
Big Lake Field	23,328
Crane County	117,160
Crockett County	2,274
Ector County	14
Glasscock County	S.D.
Howard County	3,213
Jones County	1,480
Loving County	20
Mitchell County	3,484
Pecos County	26,878
Runnels County	115
Scurry County	45
Upton County	20,635
Winkler County	10,636
Total West Texas	209,282
Increase	13,517
Grand total North and West Texas	354,532
Increase	11,864

MEXICO BIG GASOLINE BUYER, REPORT SHOWS

During the calendar year 1926, Mexico imported 33,080,081 liters of gasoline, according to statistics just made public by the Bureau of Special Taxes of the Mexican Treasury Department. The federal road tax of three centavos per liter (about 6 cents, United States currency, per gallon), established by the presidential decree of August 26, 1925, amounted to 992,402.43 pesos on this imported gasoline.

The following table shows imports of gasoline during 1926, by ports:

Port of Entry—	Liters	Amt. of Road Tax (Pesos)
Acapulco, Guerrero	27,955	838.64
Agua Prieta, Sonora	336,919	10,107.59
Bahia Magdalena, Lower California	700	21.00
Ciudad Camargo, Chihauhau	12,282	368.46
Ciudad Guerrero, Tamaulipas	414	12.42
Ciudad Juarez, Chihauhau	1,782,404	52,472.11
Ciudad Mier, Tamaulipas	97,125	2,913.75
Cozumel, Quintana Roo	69,830	2,094.90
Ensenada, Lower Calif.	441,160	13,234.81
Frontera, Tabasco	9,803	294.08
Guaymas, Sonora	250,931	7,527.94
La Paz, Lower California	37,218	1,116.54
Laredo, Tamaulipas	4,341,079	130,232.37
Los Algodones, Lower California	23,198	695.93
Manzanillo, Colima	97,793	2,933.80
Matamoros, Tamaulipas	1,584,214	47,526.42
Mazatlan, Sinalca	187,045	5,611.36
Mexicali, Lower Calif.	3,511,152	105,333.56
Naco, Sonora	603,346	18,100.38
Nogales, Sonora	12,641,392	379,241.75
Payo Obispo, Quintana Roo	258,528	7,755.84
Piedras Negras, Coahuila	3,924,441	117,733.23
Progreso, Yucatan	291,864	8,755.92
Puerto Angel, Oaxaca	45,038	1,351.14
Reynosa, Tamaulipas	21,314	639.42
Salina Cruz, Oaxaca	45,406	1,362.19
San Blas, Nayarit	16,086	482.58
San Jose del Cabo, Lower California	21,140	634.20
Santa Rosalia, Lower California	85,284	2,558.52
Sasabe, Sonora	129,968	3,899.04
Tampico, Tamaulipas	30,280	908.40
Tecate, Lower Calif.	10,871	326.12
Tijuana, Lower Calif.	683,016	20,490.47
Topolobampo, Sinaloa	846,097	25,382.91
Villa Acuna, Coahuila	192,107	5,763.22
Yavaros, Sonora	422,681	12,680.42
Totals	33,080,081	992,402.43

Imports and Consumption

A general view of those districts in Mexico which furnish the best market for gasoline may be obtained from the following table, showing destination of native and imported gasoline:

1926

States—	Liters	Tax Paid (Pesos)
Aguascalientes	1,240,074	37,202.22
Lower California	5,670,284	170,108.52
Campeche	1,086,922	32,607.66
Coahuila	11,817,419	354,532.57
Colima	766,947	23,008.41
Chiapas	223,559	6,706.77
Chihauhau	8,077,936	242,338.08
Federal District	25,879,780	776,393.40
Durango	923,813	27,714.39
Guanajuato	3,249,135	97,474.05
Guerrero	688,791	20,663.73
Hidalgo	1,345,620	40,368.60
Jalisco	5,894,827	176,844.81
Mexico	1,505	45.15
Michoacan	786,269	23,588.07
Nayarit	38,656	1,159.68
Neuvo Leon	6,216,500	186,495.00
Oaxaca	287,608	8 628.24
Puebla	1,226,948	36,808.44
Queretaro	702,432	21,072.96
Quintana Roo	351,092	10,532.76
San Luis Potosi	3,390,462	101,713.86
Sinaloa	1,903,267	57,098.01
Sonora	15,737,181	472,115.43
Tabasco	1,838,444	55,153.32
Tamaulipas	18,427,390	552,821.70
Vera Cruz	56,744,796	1,702,343.88
Yucatan	4,367,212	131,016.36
Zacatecas	927,175	27,815.25
Total	179,812,044	5,394,361.32

Source: Acting Commercial Attache George Wythe, Mexico City, August 3, 1927.

Buckeye Pipe Buys Ohio Oil Pipe Lines of Pure Oil Company

NEW YORK, Oct. 18.—Sale of oil pipe lines of the Pure Oil Co. in Ohio to the Buckeye Pipe Line Co. was officially confirmed here today although Buckeye officials have not received word of approval of the sale by the Ohio Utilities Commission, reported given October 17. The lines involved are all gathering lines and do not involve any gas pipe line properties. The consideration was $800,000.

Negotiations have been completed for sale of the Pure Oil gathering lines in West Virginia to the Eureka Pipe Line Co., and in southern Pennsylvania to the National Transit Co. Consummation is contingent on approval of the sale of Ohio lines to Buckeye company. The Pure Oil trunk line to Marcus Hook will not be sold. It connects with Eureka line in West Virginia. Deals will involve a total of several million dollars.

A. L. FORQUER DEAD

A. L. Forquer, purchasing agent for the Amerada Petroleum Corp., died at his home in Tulsa on Friday, October 14, of heart disease. Mr. Forquer was a valued employe and a highly respected citizen with a wide acquaintance in the oil business and supply trade. The funeral was held Monday in Tulsa.

Late Fields

(Continued from Page 47)

67,970 bbls. The 914 wells averaged 474 bbls. per well.

KANSAS

The first siliceous lime well in the neighborhood of the Rainbow Bend Field in Cowley County is the Barnsdall Oil Co.'s No. 1 Thurlow, SE cor. NE, Section 7-33-3e, 1½ miles north of the Rainbow Bend production. The lime was topped at 3,487 feet and at 3 feet in the well started at 27 bbls. per hour. The oil is 41 gravity. This well offsets what was practically a failure in the same formation and no great significance is attached to it.

WEST TEXAS

FORT WORTH, Tex., Oct. 18.—In Crockett County, Young & Donnelly's No. 1 Shannon at the center of Section 11, Block 9, D. & S. E. Survey, has 8,000,000 of gas at 1,662-70 feet. This is about 10 miles southeast of the World Pool and about 7 miles northeast of the old gasser which was drilled by Holman Cook and bought by The Texas Company their No. 1 Todd. The gas in the two wells seems to be the same. In Winkler County White Eagle Oil & Refining Co.'s No. 1 Collins in Section 30, Block 74, northwest of Hendricks Field, is drilling at 3,165 feet in broken lime. Elevation is 2,830 feet.

BIG LEASE DEAL

FORT WORTH, Tex., Oct. 18.—Marland Oil Co. sold to Murchison Oil Co. its 50 acres in the Hendricks Pool of Winkler County for $250,000 of which $100,000 is cash and $150,000 is to be paid in oil. This acreage comprises full interest in the SW SW, Section 35, Block B-5, and one-quarter interest in the NW SW, same section. The latter 40 acres has one producer and two drilling wells which will drill out plug tonight or tomorrow. The full interest tract has three drilling wells. Murchison previously owned one-quarter interest in the north 40 while Cranfill Brothers Oil Co. owns the other half.

Technical Questions Answered

BY CHARLES K. FRANCIS, PH.D., TECHNICAL EDITOR

The Question and Answer Department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry. Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible so as to assure a satisfactory answer.

All inquiries should be signed and if other than the given initials are to be used please indicate the desired letters.

Questions involving patented processes, intricate formulas and calculations and estimates of costs, for obvious reasons, cannot be answered. The replies will appear on this page within a reasonable time.

HEATING VALUE CORRESPONDING TO GRAVITY

Is the heating value of various oils a direct relation to the weight of the oil, and will you kindly furnish some examples showing the relative values?—H. S. L.

The heating value of petroleum oils shows a quite definite trend with weight. This may be illustrated by the table given below, which includes a range from fuel oil through gasoline, showing the approximate heating value.

Gravity Specific	Gravity A.P.I.	Heating Value B.t.u.
.70-.75	70.6-57.2	21,060-21,430
.75-.80	57.2-45.4	19,980-21,060
.80-.85	45.4-35.0	19,575-19,980
.85-.90	35.0-25.7	19,220-19,575
.90-.95	25.7-17.5	18,900-19,220

A convenient formula for calculating the heating value of an oil from the gravity was developed some years ago by Sherman and Kropff, as reported in the Journal of the American Chemical Society, page 1,626, vol. 30, 1908, as follows:

B.t.u.=18,650+40 (A.P.I. degrees—10)

The original formula was based on Baume degrees but the modern expression of gravity in A.P.I. degrees has been substituted.

VAPOR PHASE CRACKING

Will you kindly give a description of vapor phase cracking and discuss the merits of this form of cracking?—M. P. R.

A vapor phase cracking process is one in which the oil is converted into vapor and the vapor then subjected to cracking conditions. These may include the application of additional heat while the vapor is under pressure or the vapors may be brought to the desired temperature in one operation.

Vapor phase cracking has been in commercial operation for many years for the manufacture of artificial gas. In this industry the oil is decomposed at high temperatures at normal pressures and the quantity of fixed gas produced is large.

There have been numerous efforts to develop processes for cracking petroleum in the vapor phase for the production of gasoline and kerosene. In the past objection has been raised to the methods proposed because of the excessive losses in the form of gas, the large quantity of colored and unsaturated substances produced, large quantities of carbon, and the failure to design safe apparatus. The low specific heat of the oil vapors and the high temperatures carried on the tubes have in several processes brought about conditions which have been difficult to control and consequently injurious to the equipment. Overheating has developed because the tube temperatures have been higher than the low specific heat of the vapors would permit adequate absorption of the heat, consequently hot spots developed and caused fires or shutdowns.

A recent development of the market has been a demand for motor fuels having appreciable antiknock values, and these are to be found in large percentages in the various substances produced in vapor phase cracking. The decomposition of the numerous petroleum compounds is known to take place easier and at lower temperatures in the vapor phase than in the liquid phase. The high temperatures which have been employed in liquid phase cracking bring about excessive splitting of the oil particles, and it appears that methods will be developed for cracking at comparatively low temperatures in the vapor phase with the consequent formation of larger molecular particles, consequently less gas and less carbon.

SPECIFICATIONS FOR MOTOR FUEL BENZOL

What are the usual specifications for benzol which is to be blended with gasoline? What are the chief objectionable substances that may be present in benzol?—H. C. W.

The following is the specification of the British Engineering Standards Association for motor benzol.

Specific gravity 0.870 to 0.885 at 15.5 degrees Centigrade or 60 degrees Fahrenheit.
Distillation .....60 per cent at 90 C. or 130 F.
75 per cen. at 100 C. or 212 F.
90 per cent at 120 C. or 248 F.
Dry at 125 C. or 257 F.
Residue .....Not over 0.01 per cent
Total sulphur .....Not above 0.4 per cent
Freezing pt., Not above minus 14 C. or 6.8 F.

Pure benzol has a constant boiling point of 80 degrees Centigrade or 176 degrees Fahrenheit, but the commercial product is known as 90 per cent benzol and should have a boiling range close to the above.

The most objectionable substance found in benzol is sulphur and when large quantities are to be used it is necessary to be assured that this element shall be reduced by proper purification to the minimum.

PARAFFIN WAX CRYSTALS

When slack wax is sweated out there appears to be considerable difference in the structure of the wax. Sometimes the wax seems to be very coarse and at other times very fine. This condition is also noticed in parts of the same batch. Can you give me any reference explaining this?—A. B. A.

There have been several very good articles dealing with the crystallization, melting point and other properties of wax in recent numbers of Industrial and Engineering Chemistry. The paper by Rhodes, Mason and Sutton, vol. 10, page 935, August 1927, deals with the wax crystals. The brief outline from this article given below may give you the desired information.

Slack wax was separated in fractions from Pennsylvania petroleum by sweating. The average molecular weight increased with the melting point of the waxes prepared. The melting point of these waxes varied between 110 degrees Fahrenheit and 134 degrees Fahrenheit. Microscopic examination revealed that two types of crystals were formed; these were needles and plates.

It is a well established rule in the formation of crystals that rapid formation gives small crystals and large ones are produced when the conditions favor slow formation. These investigators found that in every case the waxes start to solidify as small plates. With rapid cooling—greater than 0.1 degree Centigrade per minute—these plates almost immediately begin to undergo a change in habit, becoming polygonal in outline, the edges of the plates roll up and from these edges there develop needles tangent to the original plate, both needles and plates grow at the expense of the smaller crystals. Finally, the mass solidifies completely to a coarse grained mixture of needles and plates, the relative proportion of the two types of crystals being determined by the rate of cooling. With rapid cooling the wax consists chiefly in fine needles mixed with a few small plates.

OLEIC ACID IN LUBRICATING OILS

Is oleic acid the principal acid present in lubricating oils? We have had a sample of pure lubricating oil tested by a chemist who reports a trace of acid as oleic and we cannot understand the presence of this acid, can you give us any reason for this?—M. M.

Oleic acid may be a natural constituent of some compounded oils and greases. The normal acids of pure lubricating oils are the petroleum acids grouped under the term naphthenic acids. These may be formed in the oil during the heating in the refining process. They are not considered strong enough to do any damage to metal surfaces. When a lubricating oil is not properly treated there may be traces of acid left in the finished oil. This is usually sulphuric acid and is corrosive.

The method for reporting the acidity of a lubricating oil is to state the quantity in terms of oleic acid. This does not mean that all or any of the acidity is due to this particular acid but is simply a standard term so that acidity may be expressed on a uniform basis for comparison. Positive identification of the acids, especially the petroleum acids, would be very difficult so it is convenient to use oleic acid for the calculations.

COATING WITH LEAD TO RESIST CORROSION

Is it possible to apply a coating of lead to iron and steel in such a manner that it will unite with the iron to form a surface which will protect the iron from corrosion? Possibly pipe, tanks and refinery equipment used in handling corrosive oils could be protected by this method?—K. L. Y.

The large scale operations in the field for the production of oil; in the transportation and in the manufacture of petroleum products, have prevented the use of applied metal coverings such as you suggest. Such processes are so expensive that they have been confined to small units. Lead coating cannot be used where it will be exposed to high temperatures, such as the inside of stills, where the heat may be sufficient to melt the thin film of lead.

According to Industrial and Engineering Chemistry a special lead coating process has recently been developed and is being used in some equipment which must resist corrosion.

The process is based upon a special formula flux which so prepares the surface of base metal as to promote the application of a thin, flawless, adherent coat of pure lead, upon which further layers of lead may be placed to any desired thickness by means of the ordinary lead-burning process. The outstanding feature of the process is that in the absence of other metals ordinarily required to cause the lead to adhere satisfactorily, electrolytic and other actions which frequently cause lead coating to buckle or loosen are eliminated.

The process has recently been employed on evaporator shells and covers, 6,000 pounds of lead coating being required for a single unit, the manufacture of lead-lined tanks for pickling and plating, and the manufacture of high-pressure steam coils for immersion in hot pickling solutions, etc.

Employing the same process a new type of lead-lined drum has recently been approved by the drum committee of the Manufacturing Chemists' Association and by the Interstate Commerce Commission under Shipping Container Specification 7-A, for shipping and transporting sulphuric acid of all strengths, battery acid, electrolyte acid, and hydrofluoric acid.

COMPARISON OF OIL AND GASOLINE TRUCKS

What progress has been made in the building and operation of oil engines similar to the Diesel engine for the operation of automobiles?—J. T. P.

The high cost of gasoline has encouraged the use of oil engines in Europe and much success has been attained, especially in Germany, in the operation of trucks equipped with oil burning engines of the Diesel type. There has not been any great advance made in adapting this kind of engine to the automobile of the pleasure car class. However, when gasoline becomes expensive the oil-burning engine will command serious attention.

An interesting and valuable contribution to this subject may be found in the current number of Oil Engine Power, page 677, in which comparative operating costs of a Diesel truck and a gasoline truck are given. Both trucks were equal, three tons, in size. The gasoline truck required fuel at the rate of 6 miles to the gallon; the oil truck made 10 miles to the gallon of fuel oil. Gasoline was set down for this test at 22 cents, and the fuel oil at 5.5 cents a gallon. The total operating cost per mile was $0.1423 for the gasoline truck and $0.1064 for the oil truck. This was an indicated saving, in favor of the oil burning truck of $0.0359 per mile, or $430.80 a year of 12,000 miles driving.

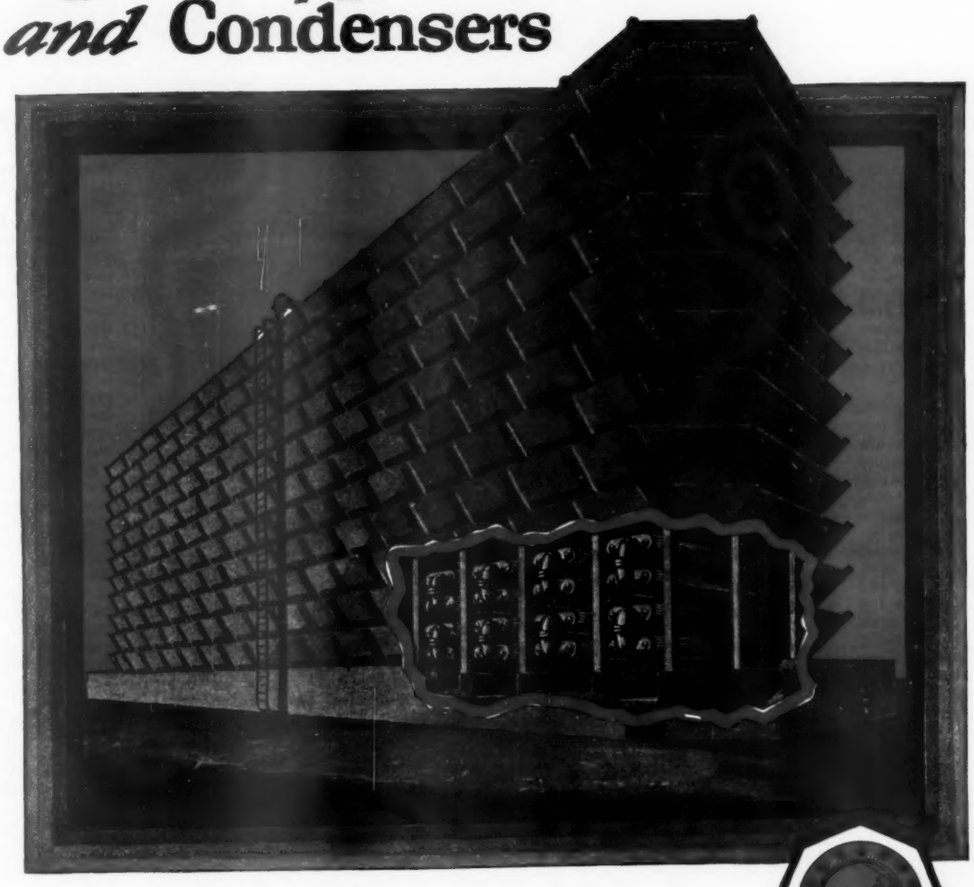
There is every indication that the Diesel truck will actually assume a position of considerable importance in the automotive world, but it is very doubtful as to whether within the present scope of the art, an oil engine can be built to such high standards required in the pleasure car and still be capable of manufacture at a cost which is in any way comparable to the cost of gasoline engines.

A crude oil engine whose fuel cost will be a fraction of that of an ordinary motor has been invented by an Australian, according to the automotive division of the Department of Commerce.

A Sydney engineer, C. E. Grayson, is reported to have invented and satisfactorily tested a new type of crude oil engine, based on the principle known as "constant pressure combustion cycle," its chief characteristic being that air only is compressed to a high pressure, creating a temperature of 900 degrees Fahrenheit liquid fuel then being injected into this red-hot air and combustion following immediately. The inventor claims that the fuel cost will be one-seventh to one-ninth that of the ordinary motor.

BRAUN

Open Type Coolers *and* Condensers



DESIGNED structurally to form a compact unit with the standard Braun Cooling Tower. There is an obvious advantage in purchasing tower and open cooler as a unit from one manufacturer, whose guarantee covers both.

C·F·BRAUN & CO
Manufacturing Mechanical Engineers
ALHAMBRA·CALIFORNIA
NEW YORK·DALLAS·TULSA
U·S·A

Natural Gasoline as Domestic Fuel

Widening Market for Butane and Propane Fractions as Bottled Gas in Areas Not Served by Natural Gas

By W. T. Ziegenhain

Rural communities outside the natural gas areas are becoming acquainted with a new product of natural gasoline as a convenient, clean fuel. The fuel is a closely fractionated product usually consisting of a mixture of butane and propane. It is manufactured by several companies and because this fuel requires burners different from the ordinary artificial or natural gas burners, some manufacturers also offer for sale a complete line of stoves and heaters.

The problem of economically distributing the fuel and the relatively small amount of it used up to this time has not encouraged manufacturers to develop the full possibilities of this fuel. At present most of it is produced in the eastern states, mainly Pennsylvania, and it has found a good sale in Indiana, Illinois, Pennsylvania and states bordering this area. Some of this material has been made in the Mid-Continent and the problem of production and distribution is being given further consideration. In most cases the districts which have already adopted this type of fuel are in the natural gas fields and are acquainted with the advantages of natural gas over artificial gas, coal and wood but cannot be supplied with natural gas by pipe line as cheaply as this fuel.

Method of Transportation

The fuel is supplied the consumer in small drums which usually weigh less than 100 pounds when filled. These are equipped with a valve and a connection so they can be hooked into the supply line conveniently. Manufacturers supply this in larger containers at times and distributors redrum the material. Helium cylinders have been used for this purpose. The kind of drum used is dependent upon the pressure at which the gas is held and this may vary from a few pounds to 100 pounds per square inch depending upon the manufacturing methods. Uniformity of quality is a main requisite for its use and because there are several sources for the material and the properties of the material vary, different types of burners have been designed and there is a decided lack of standardization as yet.

Ordinarily, two drums are attached to the system at the same time, which allows for continuous service when one drum is exhausted and is being replaced by a full one. Although the great majority of users would require but one drum at a time, the system could be made to draw from any number of drums by simply providing enough connections on the supply line. Installations made in rural schools and hospitals often require several drums. This method of unit installation has provided flexibility in case of expansion. If the load was sufficient to require a great many drums and these were used continuously larger containers might be feasible but so far there has been no such need and the field of this type of equipment has remained with the small consumer.

There are instances where there is a short, heavy load such as in a classroom for cooking where many stoves are in use for a half hour or more and in that case two or three drums may be in use at once and an example of such a case is shown in the accompanying view of an installation made in a high school located in Westminster, Ohio.

In communities where bottled gas is being supplied the distribution is being done by local dealers. The drums are permanent property of the producer, so the customer is relieved of any expense except for the fuel itself. The use of bottled gas requires a special burner but where this method of heating is to be used, stoves of most any standard description can be supplied. These include the ordinary type of gas ranges, hot plates, ovens, marine stoves, water heaters and various kinds of heaters for rooms.

Advantages of Fuel

Aside from its convenience and cleanliness, it is economical considering the advantages it has over coal, wood or even kerosene and gasoline. Experiments conducted at Iowa State College over a period of several months have shown the cost of operation to run approximately 2 cents per burner per hour. It is difficult to estimate the exact cost for all conditions because the burner is seldom turned on to its full capacity. Burners also vary in size.

To arrive at a fairly representative average actual cost, meals were prepared for six people over a month's time, using the oven as well as the top burners and the average daily operating costs for the individual meals showed 2 cents for preparing breakfast, 12.8 cents for dinner and 6.5 cents for lunch, making the total daily cost 21.3 cents.

On this basis, the cost of fuel for cooking would be $6.40 per month. If fewer or more people were to be served, the cost would be very nearly in proportion. Consumption of the liquid was measured by noting the volume of the liquid remaining in a glass bottle as it was used. Accurate checks were made on the amount of fuel needed to cook a number of different foods.

The use of natural gas is now receiving considerable impetus as a result of extending lines from the Panhandle to Kansas City and others to Colorado. Other projects are under way in California and numerous small installations are being made in and bordering the natural gas areas, all of which prove the popularity of gas as a fuel. These installations would not be made either, if there was not complete assurance of a continuous, adequate supply for many years into the future. But the extension of these lines is limited to large cities at not too great a distance from the producing fields and the only economic means of supplying this method of heating to the vast areas on the outside, is to concentrate the gas by liquefaction and transport it in the same manner as coal or wood or oil. Bottled gas is much more compact for shipment than any of these, considering the effective heat supplied per pound of material. It not only permits cleanliness in operation but may be stored leaving no trace of dirt.

Figure 1—Domestic science classroom in Pennsylvania school equipped to use "bottled gas" as fuel.

New Use Logical

With the present high production of natural gasoline and the relatively low prices paid for the material manufacturers are looking for new uses of their products and this use is logically chosen. Because a different burner is required for this fuel than found on the ordinary gas stove it is not just a matter of setting up an ordinary gas stove alongside the drum of liquefied gas. This has complicated the problem sufficiently to confine the manufacture to relatively few companies. Along with this handicap on the part of manufacturers, the problem of distribution is a big one and unless oil companies manufacture it and distribute it through their regular bulk stations its distribution would probably be costly.

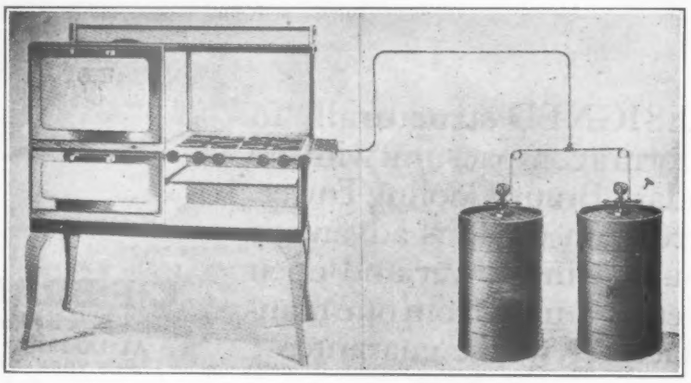


Figure 2—Typical installation showing bottled gas connected to stove.

The unit cost to the consumer is largely a function of the volume consumed and as the volume grows quantity production and distribution would lower the unit cost. The possibilities offered by this field seem very encouraging but it would probably be a matter of several years at least before the volume consumed would have any weight on the natural gasoline market. From a manufacturing standpoint the material might be made as a by-product during the stabilizing of natural gasoline with the result that a good quality of natural gasoline could be produced free of the more volatile constituents and yet these lighter fractions after thus being fractionated out could be further processed to make this highly desirable fuel.

Desirable Fuel

In the experiments it was found the stove was easy to operate, easily kept clean and the flame did not form soot on the utensils. The fuel furnishes an even, intense heat with a short blue flame visible. If the food happens to boil over the burners are so constructed that the flame is not easily extinguished and if it is extinguished, the odor of the gas is easily detected. It burns without producing an odor and there is little chance of incomplete combustion to form carbon monoxide.

Calorimeter tests have substantiated the high calorific value claimed for the fuel and also shown the fuel burns efficiently in the burners provided.

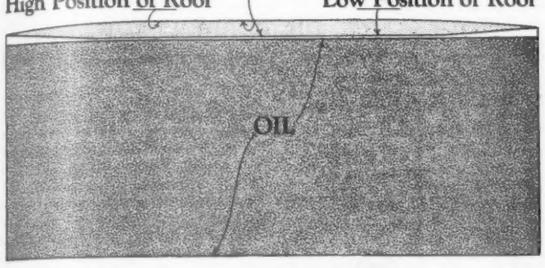
The advantages of this fuel are apparent and with the cost within reason, its adoption in the northern parts of the country might be expected to be similar to that of oil burners. From the standpoint of bare operating cost it is generally conceded that the oil furnace installed in private dwellings costs more than coal or wood, the two natural competitors of oil.

But convenience, compactness and cleanliness of oil heat make up the difference and those people who have installed the oil burners would not go back to the older methods. These same facts are true for bottled gas. Bottled gas supplies a heat only when in use and because its heat is localized at the burner it serves as an ideal fuel in the summer time.

Most of this material is being distributed in the rural districts east of the Mississippi River, especially throughout the States of Illinois, Michigan, Wisconsin, Indiana, Ohio and the New England States. It is generally being sold at $6.50 per 10-gallon drum which makes the cost 65 cents per gallon delivered. This is said to be comparable to ordinary artificial gas at $1.40 per 1,000 cubic feet. At present practically all of the bottled gas supplied that territory is being manufactured in Pennsylvania. The use of it has been approved by the National Board of Underwriters and the containers are constructed to meet the requirements for the transportation of liquid fuels.

But as yet, there is no complete standardization of either the equipment or the product and this is serving as a material handicap in the extension of the use of this fuel. Absolute uniformity is required in the quality of the material which makes it difficult for the products of different manufacturers to be used interchangeably. Just what success would result in an attempt to standardize the fuel to open a larger field for its use and manufacture remains problematical and possibly the great bulk of the natural gasoline manufacturers will not attempt to enter the field.

A New Movement in tank roofs



OIL men are familiar with the Wiggins Floating Roof which prevents evaporation by moving up and down with the volume of oil in the tank. The designer of this floating roof has now developed a companion type, the Wiggins Breather Roof. It does not move in the sense formerly associated with Wiggins Roofs. But it does stop evaporation by movement.

This movement — revolutionary in tank roofs—is simply a flexing. The edges of the roof are attached rigidly to the tank rim. When the temperature rises during the day the vapor pushes the roof up and when the temperature falls at night the tank settles down with the reduction in vapor volume. On a 55,000-barrel tank the center of the roof moves from an extreme lower position approximately 10 inches below the tank rim to an upper position about 10 inches above the horizontal. Except in very rare cases, the variation in vapor volume will not equal the provision made for it under this roof and there will therefore be no loss of vapor through thermal breathing. A mechanical pressure relief valve set to open when the roof reaches its maximum upper position and a vacuum relief opening at the extreme low limit of travel protect the roof during filling and emptying and extreme variations in temperature.

The wide acceptance of the Wiggins Floating Roof is ample evidence that the oil men appreciate the necessity for stopping evaporation losses. The floating roof is unequalled for working storage where evaporation includes filling and emptying losses. But on standing storage the breathing losses continue day after day through long periods of storage. The Wiggins Breather Roof is the first real, economical preventive measure designed specially to prevent this loss. It has already demonstrated its effectiveness in the field. Ask our nearest office for further data. The new booklet on the Wiggins Breather Roof for standing storage will be sent on request.

Send for this illustrated booklet

CHICAGO BRIDGE & IRON WORKS

CHICAGO, 2128 Old Colony Bldg. DALLAS, 1641 Dallas National Bank Bldg.
NEW YORK, 3147 Hudson Terminal Bldg. ATLANTA, 1054 Healey Bldg.
CLEVELAND, 2204 Union Trust Bldg. HAVANA, CUBA, Apartado 2507

WIGGINS FLOATING ROOFS *for working storage* **BREATHER ROOFS** *for standing storage*

O&GJ 10-20 Gray

Of Interest to Sales Departments

New Competition Brings Low Prices In Rocky Mountains

DENVER, Colo., Oct. 15.—The recent consolidation of service station ownership, a series of reductions in the prices of gasoline, and maneuvers in certain quarters apparently directed towards the strengthening of the position of local refiners in their natural territory, has caused a considerable flurry in marketing conditions in the Rocky Mountain area. When the situation clears up to some extent, it is generally believed the Standard Oil Co. of Indiana will be found to have obtained a substantial foothold in this territory as a retail marketer. The basis for this report lies principally in the purchase within the past few months of numerous service stations in Colorado, New Mexico and adjacent territory by the Vickers Petroleum Co. The latter company is said to be allied with the Midwest Refining Co., which in turn is controlled by the Standard Oil Co. of Indiana.

The situation that has developed involves a number of angles that gives to it more interest than ordinarily might come from the competitive cutting of gasoline prices. One of these is an outgrowth of the isolated geographical position of the oil industry in this area in its infancy when no one could foretell what the future had in store for it. The growth of the industry has been progressive over a long period of years. The Continental Oil Co., back in 1912 when the Midwest Oil Co. built its first refinery at Casper, was exclusively a marketer and the largest in the Rocky Mountain area. The Midwest Oil Co. did not enter the retail field, but found a good customer in the Continental, which marketed most of its products. Salt Creek, which supplied the crude for the small refinery at Casper, became a more important oil field than was expected. The Midwest Refining Co. was organized as an outgrowth of Midwest Oil and, subsequently, Standard of Indiana acquired control. Refining capacity at Casper was increased steadily to meet the requirements of the Salt Creek Field until the investment in plants now is in excess of $25,000,000.

Salt Creek is capable of producing from completed wells far more crude oil than the Casper refineries require for their market demands, with the result that many millions of barrels have gone into steel storage and many wells are shut in. One of the natural consequences of the situation that had developed was a move to broaden the market for the Rocky Mountain crude and its products. A standing order for gasoline for export which involved the shipment from the Midwest-Standard refineries of from 5,000,000 to 13,000,000 gallons per month was secured about six years ago.

Crude Oil Situation

In 1923, the Sinclair Pipe Line Co. owned jointly by the Standard of Indiana and the Sinclair Consolidated Oil Corp., built a 717-mile pipe line from Wyoming to Missouri at a cost of $25,000,000. This line was constructed when a flood of oil was coming from Salt Creek, when the Mammoth Oil Co. had great hopes for Teapot Dome, and when the Sinclair interests had secured the contract for the Government's royalty oil. It looked as if the isolation of the Rocky Mountain area had been broken.

The big production from new pools in the Mid-Continent Field and resultant low prices of crude and its products are said to have had a direct effect on the Rocky Mountain situation, though other factors were present. The big export order was switched to affiliated interests nearer the exporting port the past summer and market conditions in the East were unfavorable for moving large quantities of crude from Wyoming into a territory already oversupplied, even if such a movement had been desired. In order to meet the new conditions, the Casper refineries have curtailed their runs to a considerable extent.

Mid-Continent Competition

Another factor developing within the past year or two was the steadily increasing quantity of Mid-Continent gasoline coming into the Rocky Mountain area in competition with the local refineries. There was a spread of about 4 cents between the tank wagon and service station prices on this gasoline. The result was that numerous small companies operating one or more retail stations began retailing gasoline for the purpose of increasing their volume of business at 2 cents under the market established by the major companies.

This situation disturbed the market not only for the Rocky Mountain marketers who showed no disposition to enter into a competitive war. The extent of the Mid-Continent business may be judged from the fact that out of 57,701,371 gallons of gasoline sold in Colorado in the first six months of 1927, a total of 36,696,205 gallons came from Colorado, Wyoming, New Mexico and Utah, or 63.6 per cent of the whole, while 20,996,235 gallons came from Oklahoma, Texas, Nebraska and Kansas, or 36.4 per cent of the total, including some

(Continued on Page 192)

Short Talks on Specifications

By W. T. Ziegenhain

COLOR OF LUBRICATING OILS

The quality of lubricating oils is often judged by their color alone. This is not a sure way, and in fact, color is of minor importance from the standpoint of performance if the other characteristics of the oil are satisfactory. But if an oil is not properly refined it will have a dark or cloudy appearance and color does serve as a factor in that respect.

The darkness of color will usually vary with the viscosity of the oil and the heavier and more viscous oils from the same or similar crudes will be darker than the less viscous oils. Coloring matter is, essentially, impurities in the oil, for pure hydrocarbons are colorless, but this coloring matter may not be harmful. It may have been contained in the crude oil originally or it may have been formed in the still during the distillation process by oxidation of a portion of the oil.

During the further processing of the lubricants, sulphuric acid is usually mixed with the oil to remove any chemically active constituents and if this treatment is properly carried out, practically all of the oxidizable impurities are removed as a heavy black sludge and the oil becomes much lighter in color and clear.

After this operation the oil is filtered to remove traces of other impurities as may be removed by absorption. The oil is usually filtered through fuller's earth and the improvement of the color in the oil is dependent principally upon the amount of a given earth used per barrel of oil filtered. Filtering is a costly operation and its primary function is to give the oil brightness rather than to remove the bulk of the coloring matter although the filtered oil has a lighter color than the raw oil. Thus, an oil which is relatively dark in color or cloudy usually contains a high percentage of oxidation products which may form a gum or slime on the crank case and in the feeding system.

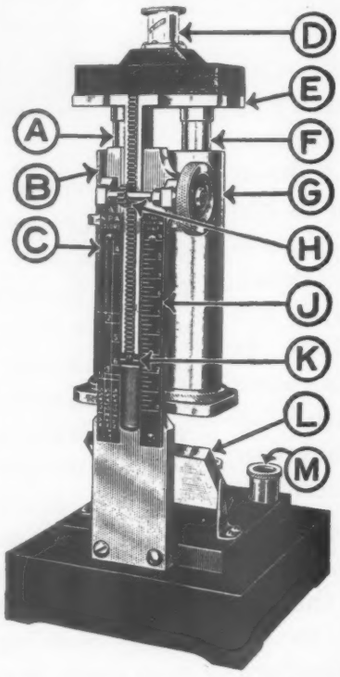
Even though this serves as an index, the only sure way to determine the quality of the oil in this respect is to run an oxidation test or a sludge test on a sample of it. The color of lubricating oils serves as a better index of quality than the color of gasoline, but as was previously stated, it serves only as a rough indication and is important only as a marketing factor in the case where the oil satisfactorily passes all other tests.

Test Method

The usual method of determining the color of lubricating oils is by the Tag-Robinson colorimeter of the Union colorimeter. Each of these may be read direct in terms of the N. P. A. scale which is used almost exclusively in marketing. The scale is based on rather arbitrary values and the colors are not additive. The lighter colors are expressed as low numbers such as 1 and 2 and the darker oils as higher numbers as 7 and 8.

The Tag-Robinson apparatus is pictured here and consists of two metal tubes, B and G, about 5 inches long.

Two smaller tubes A and F can be moved up and down in the larger ones.



Each of these smaller tubes are closed at the bottom by a glass. A mirror L is so placed as to reflect light through the tubes and into the eyepiece.

In making a test the oil is poured into the tube G. The inner tube is then raised or lowered, thus increasing or decreasing the column of oil between the end of the oil immersion tube and the base of the larger tube. A standard color glass is held in the base of the other tube and as the column of oil is varied the operator is able to find a setting where the color of the oil column just matches the color glass. When this is done the color reading may be read direct.

OIL BURNERS LOWER ON MASS PRODUCTION

CHICAGO, Oct. 17.—Very recently two leading makers of domestic oil burners have sharply reduced the price to the user of their apparatus stating their sales have increased to a point where they can give their customers the benefit of prices made possible by quantity production. Practically all now make terms, with initial payments of $50 or $75 down and the remainder in monthly payments extending over a full year, if desired. This plan will doubtless result in a more or less rapid increase in number of burners installed.

There is also a rather noticeable tendency towards a reduction in the number of makes of burners being manufactured. Some companies are being merged, others are simply dropping out. There is a marked tendency on the part of prospective buyers to place their orders for well known makes. It has been stated that there were over 400 different makers of domestic oil burners. Many were purely local concerns. Others were simply assemblages of parts.

The Oil Heating Institute has recently issued a booklet for the users intended to aid in the selection of a domestic oil burner. It lists and describes 27 makes. The booklet states that the burners illustrated and described are all made by members of the institute. It is noticeable that all use air pressure to atomize the fuel oil. One is a continuous feed burner which may be installed either with or without automatic heat control. There are no natural draft burners listed although there are many in use which give entire satisfaction.

The domestic oil burner industry has entered upon another stage, quantity production with lower prices. In Chicago and immediate vicinity, the number of burners being installed is very large. The local coal dealers admit it privately. Some of them seem to think the movement towards oil for fuel is only a temporary fad and that they will regain their trade later.

The coal men overlook one factor that has had much to do with the installing of oil burners. The factor is the constant increase in the cost of heating with solid fuel, coal or coke. Every strike at the mines or among the drivers, every freight tie-up, has been the signal for higher coal prices.

The Bureau of Mines and the Bureau of Standards at Washington have worked out some results of tests made of coal, oil and gas that indicate the comparative cost of using these different kinds of fuel. Presumably the materials used were of standard high quality. The results are based on the number of B.t.u.s in a ton of coal and the equivalent in oil or gas. The result is very close to the accepted measure among the oil men that at most 150 gallons of oil will give as much heat as a ton of good anthracite coal. The bureau's figure is that the equivalent of 10 tons of coal would be 1,340 gallons of oil. As a matter of results obtained under actual use of oil in heating plants in which coal had been burned and the average coal consumption was known, the actual requirements to heat a home that had been sufficiently heated by 10 tons of coal would be more nearly 2,000 gallons of oil but in addition to the heat given there would be a cleanliness, comfort and dependability this is not secured through the use of coal.

"NULTRA" *mirrors the purity of your gasoline*

Your gasoline displayed in a "NULTRA" glass cylinder is mirrored in all its purity—clear and water-white.

The only glass bowl for visible pumps that actually *prevents* discoloration by sunlight, "NULTRA" keeps cracked gasoline water-white. Prevents the rapid fading out of "colored" or "dyed" gasolines. And brings out, in *any* gasoline, a sparkling brilliance that reflects purity and creates more sales for the marketer.

If you* want to enhance the appearance of your gasoline—to insure against discoloration—you should get complete information about this special "NULTRA" glass bowl now furnished, when specified, on all G. & B. visible pumps *at no extra cost.*

Write for bulletin.

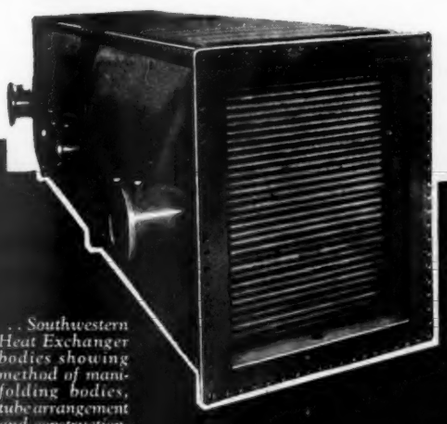
GILBERT AND BARKER MANUFACTURING COMPANY
PUMPS AND TANKS FOR THE OIL TRADE
SPRINGFIELD MASS. U.S.A.

*Over 1500 oil marketers are using G. & B. equipment.

SOUTHWESTERN HEAT EXCHANGE APPARATUS

SOUTHWESTERN ENGINEERING CORPORATION LOS ANGELES

Southwestern Heat Exchangers offer effective heat transfer where specified temperatures for the mediums involved must be realized.



Accessibility for cleaning
The removal of cover plates expose tubes for cleaning which is accomplished with a small tube cleaner, this is seldom necessary as high velocities usually keep the tubes clear.

Efficiency . . .
Small diameter tubes provide high velocity with consequent turbulence and high heat transfer rate

. . Southwestern Heat Exchanger bodies showing method of manifolding bodies, tube arrangement and construction.

Flexibility . . .
Increased capacity is easily provided for by the addition of additional sections.

Economy . . .
Materials of construction offer long life under adverse conditions Southwestern exchangers are neither expensive to install or operate.

Write for Bulletin 120

SOUTHWESTERN ENGINEERING CORP.
HOLLINGSWORTH BLDG.
Los Angeles, Calif.
Branch Joplin National Bank Bldg. Joplin, Missouri
and 90 WEST STREET, NEW YORK CITY
Branches Western Bldg., Amarillo, Tex. Mayo Bldg., Tulsa, Okla.

A848

Special for the Oil Industry

STAINLESS STEEL

CHROME MO-LYB-DEN-UM STEEL

BRASS BRONZE

4 kinds—all sizes—for application in working barrels, hot oil pumps, etc.

Their quality is evidenced by the fact that OVER 85% of the balls used in the oil industry are produced by STROM.

Strom Balls are held accurate to size to within, plus to minus, .00005 and sphericity to within .000025—*therefore all Strom Balls render a like service.* You can obtain Strom Balls through your regular supply jobber—if not, write us.

We can also furnish Strom "Stainless Steel" and Strom "Chrome Mo-lyb-den-um Steel" in bars for valve seats. These steels are developed by us and are of our own special analyses—the same as used in Strom balls.

Strom Steel Ball Co.

The largest independent and exclusive steel ball manufacturer
(Plant at Cicero, Ill.—suburb of Chicago)

360 No. Michigan Ave. Chicago, U. S. A.

HANDLING CONGEALING OIL AND PARAFFIN

(Continued from Page 124)

Creek, there was very little paraffin trouble in the large flowing wells, but as the production declined the paraffin troubles became more pronounced. If the oil string was then made smaller so that the period between flows was shortened, the paraffin trouble decreased; but as production continued to decline, the rate of paraffin accumulation again increased. When the wells were put on the pump the accumulation of paraffin was practically eliminated, providing the proper precautions were observed. This will be discussed later.

In wells where excessive cooling takes place, or where, from other causes, a large amount of suspended wax is present in the oil, a certain amount of paraffin will accumulate and become attached to the walls of the pipe even though the periods between flows are short. It is possible, also, that some of paraffin particles become attached to the pipe as they come into contact with it while flowing with the oil from the well.

In wells that are flowed artificially by compressed gas or air, the same conditions are responsible for the deposition of paraffin, and the same methods of preventing and removing the accumulated paraffin are applicable.

In wells that are produced by means of the gas lift or air lift, trouble is often encountered with paraffin deposited at the foot piece or lower end of the eduction tube; and in wells where gas is jetted into the eduction tube at various points, paraffin accumulates at these places. Paraffin also accumulates along the walls of the pipe in the same manner, and as a result of the same conditions, as in natural flowing wells.

The accumulation of paraffin around the foot piece or end of the eduction tube is usually due to using excessive quantities of gas and allowing the well to pump off. When the well pumps off, the gas flows through the eduction tube and results in a local cooling. There is often sufficient cooling and evaporation at this point to cause the deposition of paraffin, even when the well is correctly operated. It also dries the film of oil on the pipe and allows the suspended paraffin to become firmly attached. The accumulation of paraffin around the jets in the eduction tube is the result of cooling caused by the gas at this point, and the fact that the constant wetting and drying of the surface immediately surrounding these jets allows particles of paraffin to become firmly attached to the pipe.

Preventing and Removing Paraffin from Flowing Wells

In most instances, from an economic standpoint, it is advisable to prevent the accumulation of paraffin. Sometimes, however, this is either impossible or so costly that it is preferable to remove the paraffin after it has accumulated.

In order to prevent or decrease the deposition of paraffin in flowing wells, it is necessary to produce the oil so that the conditions which favor paraffin deposition, and which have been discussed, are eliminated or modified. Generally, these conditions can be modified by reducing the size of the oil string. This shortens the periods between flows, causes the oil to be lifted more efficiently, and therefore results in less cooling. It also often results in reducing the gas to oil ratio, and thereby reduces evaporation of the lighter constituents. When tubing is used, there is also less heat lost to the surrounding strata by radiation, as the space between the tubing and casing acts as an insulating medium. The use of back pressure, although not always applicable or advisable, will sometimes prevent the conditions that favor the deposition of paraffin.

Circumstances often make it impossible to prevent the accumulation of paraffin by proper production methods alone. One of the most satisfactory methods to use with such conditions is to heat the oil as it flows from the well. A number of different methods of heating have been tried, and many have been found satisfactory. It is questionable, however, whether the cost of operating these methods will compare favorably with methods for removing the paraffin after it has accumulated.

Electric Heaters for Flowing Wells

One of the most common methods of heating the oil as it flows from the well is by the use of electric heaters. These heaters are of the resistance type and are usually designed to run into the well on a wire line or so that they may be attached to the bottom of the oil string. A number of types have been patented.

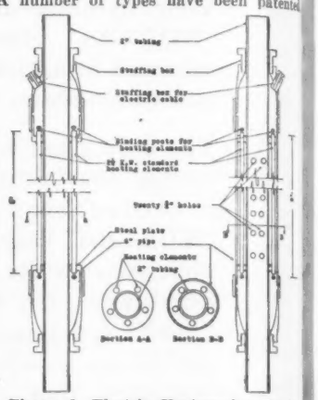


Figure 2—Electric Heaters for Use in Oil Wells.

Two types of heaters are shown in Figure 2.

These electric heaters must generate sufficient heat so that the oil will reach the top of the well at a temperature above that at which it is saturated with wax. As a general rule, it is necessary to operate them continuously in order to prevent the deposition of paraffin. If the heaters have capacity enough to heat the oil sufficiently to dissolve additional paraffin they can be operated intermittently. When used in this manner, a certain amount of paraffin is allowed to accumulate in the well, then the heaters are turned on, and the heated oil dissolves this accumulated paraffin.

The greatest objection to electric heaters is the cost of operation and maintenance. It is very difficult to build a heater that will operate satisfactorily over a long period of time under the severe conditions existing in a well. It is difficult, also, to obtain cables for transmitting the power to the heaters. As an example of the cost of operating electric heaters, the following results are given: An electric heater was placed on the tubing of a 100-bbl. well just below the point where the paraffin started to accumulate. The oil normally reached the top of the well at a temperature of 71 degrees Fahrenheit, and with the use of the heater the temperature was raised to 83 degrees Fahrenheit. This was found sufficient to prevent the deposition of paraffin. The heater had a capacity of 10 kilowatt-hours; and estimating the cost of the power at 1¼ cents per kilowatt hour, the cost of operating the heater was 12½ cents per hour—$3 per day, or $90 per month. This represents only the cost of operating the heater, and does not take into consideration other costs, such as maintenance, etc. The same could be kept in excellent condition by the use of a paraffin knife or hook once a week. Total cost of operating these tools with a portable winch would not exceed $10 per time, or $40 per month.

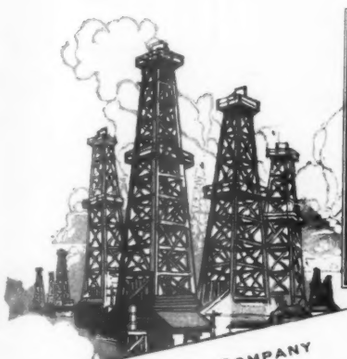
Heating by Steam, Water, Oil or Gas

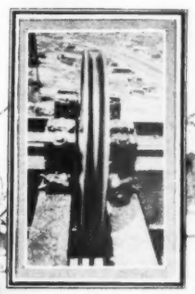
In some fields, steam is used to heat the oil while it is flowing from the well. The steam is usually put into the well through a coil, either inside of the oil string or between the oil string and the casing. Generally, the coil is connected so that it returns the condensed water to the surface instead of allowing it to run into the well and be produced with the oil. The depth to which closed coils can be operated in the well is limited by the amount of pressure available to lift the condensed water. In very deep wells, especially where the oil does not have a

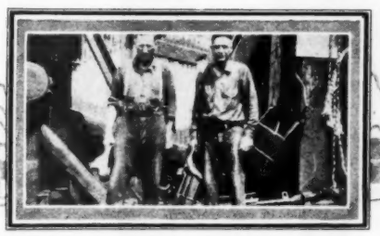
AMSCO

TRADE MARK REGISTERED

....it would be a great economy in expense as well as cut down the danger if all Sand Line and Casing Line Pulleys were Manganese Steel







Comar Oil Company
Tonkawa Field
No. 8W B. F.
Blubaugh, Sec. 2-24-1.

Crew:
H. J. Stukenburg
F. D. Lockyear
John Emerson
Hugh Ulery

COMAR OIL COMPANY

Lucey Products Corpo.,
Tulsa, Okla.
Gentlemen:

In my opinion, your AMSCO Manganese pulleys are the best on the market today. As there is very little or no wear at all on the pulley, we have noticed in our experience with wire that the wear on the line is not nearly so great as when we were using the old style cast steel pulley.

Before the company adopted AMSCO Manganese pulleys they were receiving on an average of 20 days service out of the cast steel in swabbing service here in the Tonkawa field, but the Manganese pulleys have never had to be replaced once they were put in service.

On #1W. Gaume well Comar Oil Company, Tonkawa Dist., they were using cast pulleys and having so much trouble with the trunnions heating and the grooves cutting out as fast as water line was run to pulley was put up in place of the cast steel and now bearings installed the water line was taken down and it was necessary to oil the trunnions only once a week. At this time the well was swabbing 700 Barrles of water and 165 Barrles of oil; running in and out of the hole steadily in order to prevent the water from getting the best of the well.

I am of the opinion that it would be a great economy in expense and time as well as cut down the danger if all Crown Sand Line and Casing Line Pulleys were Manganese Steel.

Signed S. K. Myers
Material Inspector, Comar Oil Company
Tonkawa, Oklahoma

COMAR OIL COMPANY

August, 30th, 1927

To Whom it may concern-

I am certainly strong for Manganese Pulleys because they require very little or no attention.

The shaft in the pulley is very easy on babbited bearings, the one on the well we are now swabbing has been in the hardest of service for over a year and the bearings have never been changed and do not now shew any wear.

Before equipping the crown block with a Manganese Crown pulley it was necessary to inspect the bearing two or three times each tower and replace the pulley itself every three or four weeks, but now with the Manganese sheave very little attention is given the crown block and then merely as a prosuction measure and not because of any trouble we anticipate from the pulley.

Yours very truly,

Signed Frank Lockyear
Tool Dresser for the Comar Oil Co.

COMAR OIL COMPANY

Tonkawa, Okla.
August, 30th, 1927

Lucey Products Corpo.,
Tulsa, Okla.
Gentlemen:

This is to advise that I am always pleased to recommend your Manganese Pulleys because they have given wonderful service on wells that I have worked on for the Comar Oil Company. While on various swabbing jobs for the above company, it was very often necessary to change the crown pulley every two or three weeks, but after discontinuing the semi-steel and adopting the AMSCO Manganese sheave our trouble was over.

Manganese, I believe will wear indefinitely and add greatly to the life of the wire line. We have yet to replace a Manganese pulley on any well I have been working on.

The pulley on the present well #8-W B. F. Blubaugh Sec. 2 - 24 - 1 Comar Oil Company, has been in constant service swabbing a 4226 ft. well making on an average 600 barrels of water and 350 barrels of oil, for a period of over a year and doesn't show any wear.

Yours very truly,

Signed H. J. Stukenburg
Driller for the Comar Oil Co.

THE Comar Oil Company's experience is typical of the other prominent producing companies who have replaced semi-steel sheaves with those of AMSCO Manganese Steel.

The letters reproduced on this page contain facts as to the economy of using *"The Toughest Steel Known"*—AMSCO Manganese Steel. The only known steel that has the peculiar quality of becoming tougher and more wear resistant through use. The constant passing of the wire line over a Manganese Steel Pulley instead of wearing away the surface, polishes it as smooth as glass.

Companies interested in reducing operating costs will investigate the various possibilities where equipment made of AMSCO Manganese Steel will effect savings in operating time, doing away with the danger of breakdowns; lessen weight of equipment and eliminate constant replacement.

In contrast to the above is this photograph showing a semi-steel casing Pulley on which the trunnion broke off, causing it to drop plugging a 3,300 ft. rotary hole at Seminole.

AMERICAN MANGANESE STEEL COMPANY

Distributors to the Oil Industry

LUCEY PRODUCTS CORPORATION — *Tulsa, Oklahoma*

BUCK & STODDARD — *Los Angeles, California*

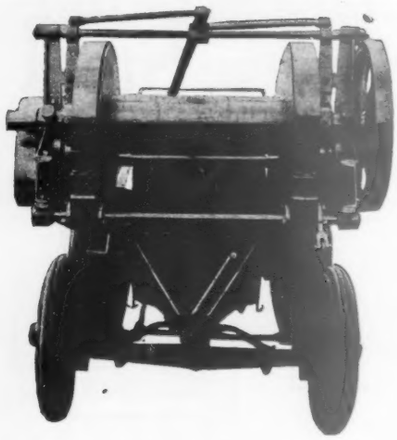
AMSCO Foundries

CHICAGO HEIGHTS, ILL NEW CASTLE, DEL OAKLAND & LOS ANGELES, CALIFORNIA DENVER, COLO.

SOUTHERN MANGANESE STEEL CO. ST LOUIS, MO.

B & A BASCO

The Samson Winch is designed and built so as to change no part of the mechanism of the Tractor. This leaves the tractor a powerful, floating power plant, transmitting its power direct to the Winch through a three-speed transmission connected to the regular power take-off, putting no additional strain on the Tractor.



Two Men Can Install the SAMSON WINCH In 45 minutes

The Samson Winch comes as a complete unit that is built on, not into the tractor. A product of the oil fields, tested and proven, it is unsurpassed for oil field work. Meeting the demands for power, durability, speed and safety, the Samson Winch on an International or Fordson Tractor is the most economical lifting unit on the market today.

Operated from tractor seat, the operator faces his work at all times making it safer for both the man operating the Winch and those in the rig.

Get the facts on the Samson Winch now. Write on the margin below or tear out this page and attach to your letterhead.

The B & A Quality Line

Baker Casing Shoe Co.
Bartlesville Supply Co.
Acme Fishing Tool Co.
Garrott Brass & Machine Co.
Dexter Valve Reseating Machines
Novo Engine Co.
Robinson Orifice Fitting

We also carry a complete line of hoists, concrete mixers, wheelbarrows and woodworking machinery.

B & A SPECIALTY COMPANY
220 East Brady St. Tel. 3-3282
TULSA, OKLAHOMA
708 Keystone Bldg., Houston, Texas

B&A Specialty Co

tendency to emulsify badly, the coils are left open, and the condensed water is allowed to drop to the bottom of the well and be produced with the oil. Several types of coils are shown in Figure 3. These coils were described to the writer by K. C. Sclater, who used them in the South Mountain Field in California.

steam coils at intervals instead of continuously.

It is questionable whether this method would be satisfactory from the cost viewpoint, unless excess steam is available without appreciable extra expense; for instance, where steam is used for pumping and where fuel gas has a very low

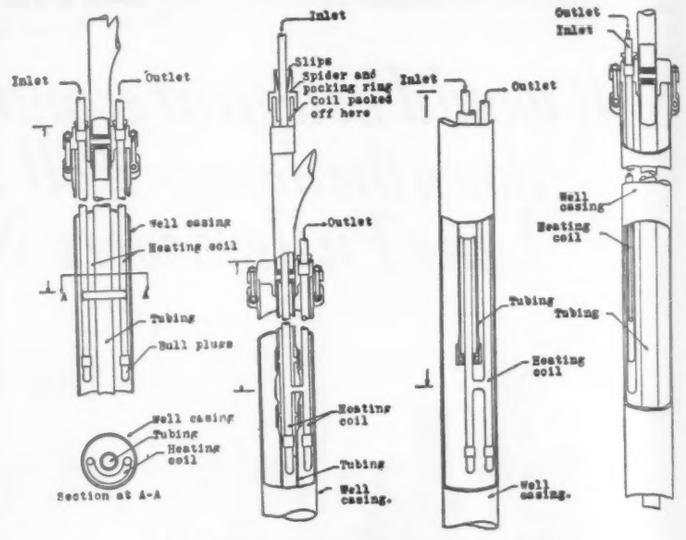


FIG. 3.—COILS FOR STEAM-HEATING IN OIL WELLS.

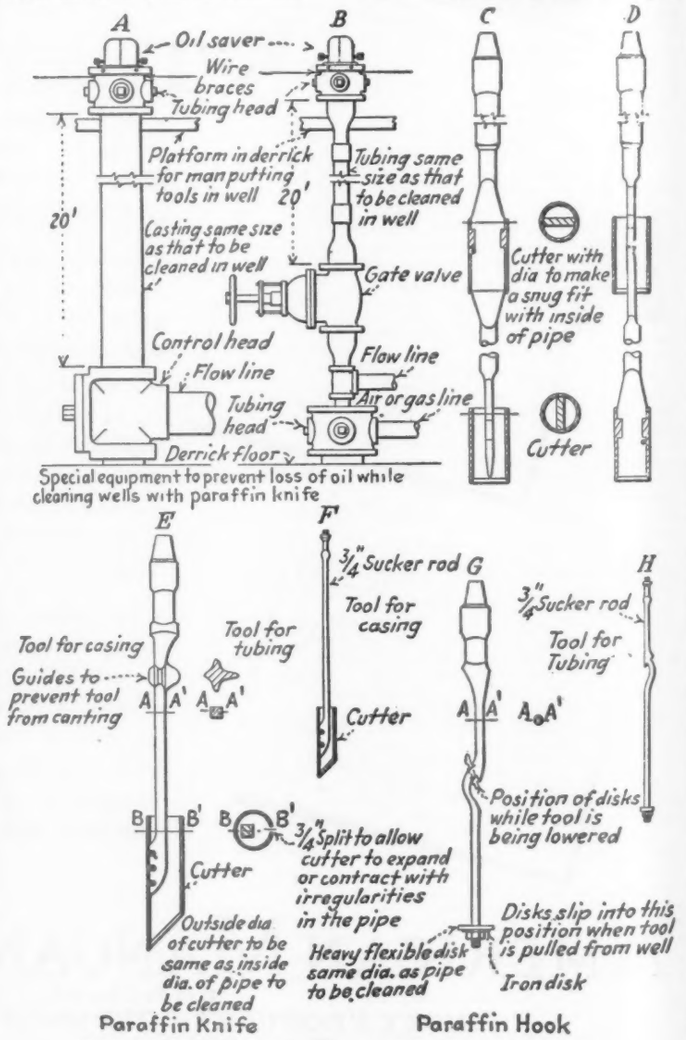

A
B
C
D
Oil saver
Wire braces
Tubing head
Platform in derrick for man putting tools in well
20'
Casing same size as that to be cleaned in well
Tubing same size as that to be cleaned in well
Gate valve
Control head
Flow line
Tubing head
Air or gas line
Derrick floor
Special equipment to prevent loss of oil while cleaning wells with paraffin knife
Cutter with dia to make a snug fit with inside of pipe
Cutter
E
F
G
H
Tool for casing
Tool for tubing
Guides to prevent tool from canting
3/4" Sucker rod
Cutter
3/4" Split to allow cutter to expand or contract with irregularities in the pipe
Outside dia of cutter to be same as inside dia. of pipe to be cleaned
Position of disks while tool is being lowered
Disks slip into this position when tool is pulled from well
Heavy flexible disk same dia. as pipe to be cleaned
Iron disk
Paraffin Knife
Paraffin Hook

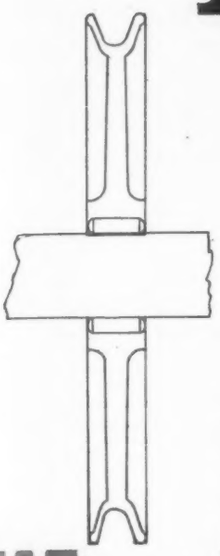
FIG. 4.—TOOLS FOR REMOVING PARAFFIN FROM OIL WELLS.

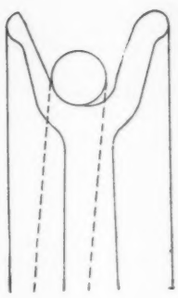
In using steam, it is possible to raise the temperature of oil sufficiently so that it will dissolve additional paraffin. It is, therefore, customary to operate the

market value. Unless this is true, it will usually prove cheaper to use the paraffin knife or hook and a portable winch.

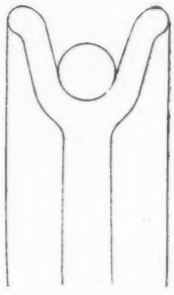
At some wells, hot water or oil is cir-

Feature No. 4

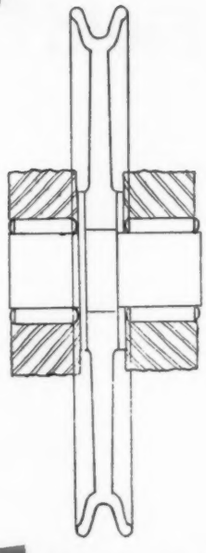




In an ordinary Crown Block the side-drag causes destruction of the sheaves and wire line, rapidly breaking down the grooves and wearing away the line.



In the new Regan Crown Block the wire line tracks in the bottom of the groove which is not deformed because there is no side-drag, thus increasing the life of the sheaves, wire line and bearings.



Wire line slippage reduced

Wire line slippage has been reduced to a minimum by the elimination of side-drag on the sheaves and by the adoption of anti-friction roller bearings; also by increasing the diameter of the fast line sheaves. Regan sheaves conform to A.P.I. specifications.

Many *new* and *exclusive* features

Feature No. 1: No side-drag on wire lines.

Feature No. 2: Lines flare in proper direction.

Feature No. 3: Large sheaves reduce bending friction.

Watch future advertisements for additional features.

Write for descriptive literature.

Regan's *new* Crown Block

Houston, Texas
1521 Post Dispatch Bldg.

New York City,
75 West St.
Wm. Braat, Manager

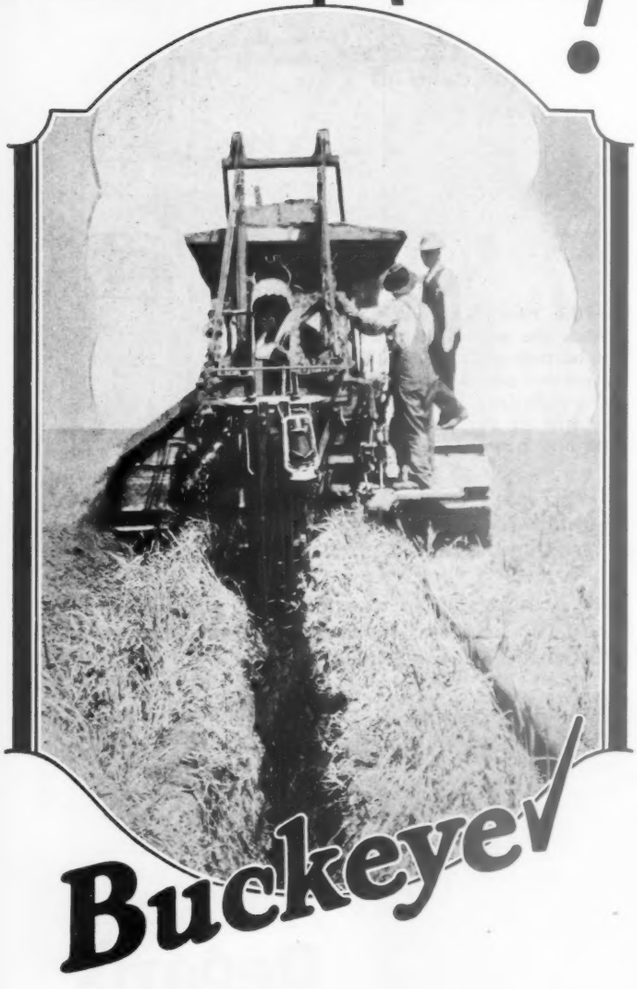
Pampa, Texas

Oklahoma City, Okla.
531 W. Main St.

Maracaibo, Venezuela
Wm. Adams,
Care Amer. Counsul

Regan
Forge & Engineering Co.
San Pedro California

Standard Oil Field Equipment!



Buckeye

That Buckeye Trench Excavators are standard oil field equipment in the oil field is proven positively by these facts:

1—More Buckeyes have been sold for pipe-line trench excavation than all other makes combined.

2—Repeat orders for Buckeyes in this field, as in others, consistently form a large percentage of our business.

Prompt shipment, of course. That's standard, too, whether new machines or replacement parts.

The
Buckeye Traction Ditcher Co.
Findlay, Ohio

There's a Buckeye Sales and Service Office Near You

Buckeye TRENCH EXCAVATORS FOR OVER 30 YEARS

culated instead of steam. The same type of coils are used, and the liquid is circulated from the heater into the well and back to the heater by means of a pump. It is difficult to raise the temperature of the oil in the well very much by this method, and the cost of operation will usually be large.

In wells that are pumped by means of the air lift or gas lift, the ingoing gas is often heated, either by a steam heater or a gas-fired heater. It is doubtful whether sufficient heat to prevent entirely the deposition of paraffin can be transferred to the well in this manner.

TABLE 3—TEMPERATURE DATA ON PUMPING WELLS AT SALT CREEK

Well—	Size of Oil String Tubing, Inches	Approx. Temp. of Sand Degrees F.	Temp. Oil at Casinghead, Degrees F.	Daily Production, Barrels
19A NE¼ 13-40-79	2	108	63	11
36A SE¼ 25-40-79	2	108	71	30
1A NE¼ 36-40-79	2	108	73	50
29A NE¼ 24-40-79	2	108	73	65
3A SE¼ 24-40-79	2	108	73	95
23A NE¼ 24-40-79	2	108	60	30

In most instances, where this method has been tried, it has been abandoned as unsatisfactory.

Special Tools for Removing Paraffin

Usually, it is cheaper, with flowing wells, to allow the paraffin to accumulate to a certain extent and then remove it by using special tools. These tools are of two general types: those that cut the paraffin from the tubing and allow the flowing oil to carry it from the well, and those that cut the paraffin from the pipe and also remove it from the well. Several types of these special tools are shown in Figure 4. The paraffin knife and flow devil can be used without interfering with the production. These tools cut the paraffin free from the pipe, and it is flushed from the well by the oil. The special head shown in Figure 4 allows these tools to be run in and out of the well without a loss of oil. In wells where the amount of paraffin is large, it is usually advisable to use the paraffin hook. This tool cannot be used while the well is flowing, and it is necessary, therefore, to use it between flows or to shut the well in. The advantage of this tool is that it removes the paraffin from the well and prevents the possibility of bridging of the loosened paraffin, as often occurs when the paraffin knife or flow devil is used on large deposits. These tools can be operated either by the standard equipment at the well or by portable electric and gasoline powered winches.

If these tools are used at regular intervals, the amount of paraffin that accumulates will not affect production. A more detailed discussion of these tools is given in the United States Bureau of Mines Report of Investigations, Serial No. 2802. The cost of removing paraffin in this manner should not exceed $10 per time, when using portable winches, and should be much less when the well is rigged up so that the tools can be operated by the engine at the well.

Deposition in Pumping Wells

The accumulation of paraffin in pumping wells gradually closes up the tubing and increases the load on the rods; and if it is not removed, the load often becomes so great that the rods break under the increased strain. The presence of paraffin also makes it difficult to pull broken rods and it often becomes necessary to remove it from the tubing before the rods can be run back into the well.

The most pronounced trouble from paraffin occurs in pumping wells in which the oil flows by heads from the tubing instead of pumping steadily. When wells produce in this manner they are usually referred to as being agitated by the pump. This condition often occurs when there is a packer between the tubing and the casing, or where the casinghead is closed and any gas produced with the oil must come up the tubing. Crude oil has a tendency to remain supersaturated with gas, and when agitated this gas comes out of solution. Agitation often occurs in pumping wells where the oil enters the bottom of tubing supersaturated with gas; as the oil approaches the top, the pressure gradually decreases, and the motion of the pump is sufficient to cause the liberation of this gas from solution. The liberated gas flows the oil above it out of the well. When agitation occurs and the oil is removed from the tubing in this manner, a thin film of oil and suspended paraffin remains on the walls of the pipe, and the paraffin becomes firmly attached in a manner similar to the way in which it accumulates in flowing wells during the periods between flows.

The movement of oil is slow in pumping wells, and the radiation of heat to the surrounding strata results in the oil being cooled appreciably. Table 3 gives the tubing-head temperature of some pumping wells at Salt Creek:

The well 23-A was producing oil by heads instead of pumping steadily, and the low temperature was probably partly due to cooling from the gas as it expanded and flowed the oil.

Paraffin also accumulated rapidly when the valves leak in wells that are pumped intermittently. This condition allows the oil to drain out of the tubing during the periods when the well is not pumped, and the paraffin then becomes attached to the pipe.

Sufficient Oil Prevents Paraffin Deposition

There is little or no tendency for paraffin to accumulate and stick to the walls of the pipe so long as it is completely full of oil. Instead, the paraffin remains suspended in the oil and is carried out of the well with it. Even on long standing, the paraffin will not become firmly attached to the walls of a pipe that is full of oil. If the oil is drained or flowed from the pipe, the suspended paraffin that remains with the film of oil will become firmly attached as the oil drains away from it and will remain on the pipe when again covered with oil. When the oil contains a large amount of suspended paraffin, some of it will accumulate on the rods and tubing, even under the best of conditions. The rate of accumulation in this manner, however, is very slow; it seldom becomes hard or extensive enough to cause trouble, and will generally be taken care of by the regular pulling of the rods for other troubles.

As previously mentioned, the most severe trouble from paraffin is found in wells that flow or agitate instead of pumping steadily. This can be stopped by taking the gas that is produced with oil out at the casinghead and by using a good gas anchor remove all the excess gas that is held in the oil as a supersaturated solution. In most cases, this will result in the well pumping steadily and will completely stop paraffin troubles. Two types of gas anchor are shown in Figure 5. When the well still has a slight tendency to flow after these precaution have been observed, a back pressure of 25 to 30 pounds per square inch held on the tubing will be effective. This back pressure has no effect on the sand,

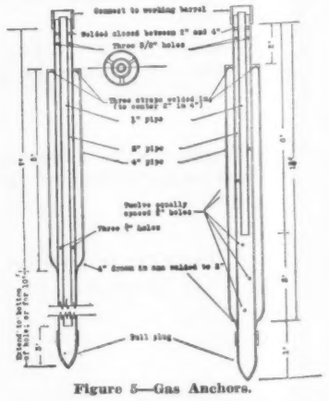


Figure 5—Gas Anchors.

Axelson Machine Co.
Sucker Rods, Pull Rods, Plunger Working Barrels (Pumps, Etc.)

Beaumont Iron Works Co.
Dreadnaught Rotary Equipment, Water-Cooled Draw Works, Pumping Hoists, Traveling Blocks, Etc.

Carbic Manufacturing Co.
Acetylene Gas Generators and Welding Equipment

Donovan Boiler Works
Oil Country Boilers and Tanks

Frick-Reid Service Belting
Rubber Covered and Friction Surface

Jensen Bros. Mfg. Co.
Pumping Jacks

National Transit Pump and Machine Co.
Power and Steam Pumps

J. P. Ratigan
Grips, Clamps, Beam Hangers

Joseph Reid Gas Engine Co.
Gas and Oil Engines, two and four-cycle, Band Wheel and Direct Drive Pumping Powers

Rossendale-Reddaway Co.
"Camel Hair" Belting, Belt Clamps

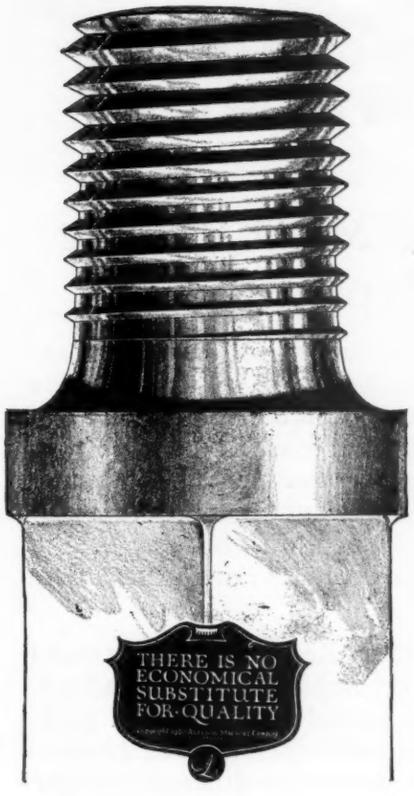
Whitlock Cordage Co.
Manila Cordage, including Frick-Reid Manila Bull Ropes —same quality for ten years.

Lapweld and Seamless Tubular Goods

Walworth Company
Valves, Fittings and Tools for Steam, Water, Gas, Oil and Air

Engineering Crews
For the installation of Pumping Powers and related equipment.

AXELSON

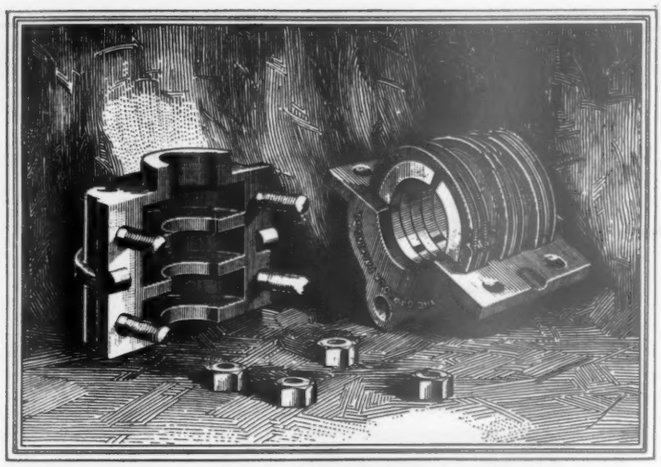


OBVIOUS in every detail, yet mysteriously potent—the Axelson Vanishing Thread. The despair of competition, the delight of the industry, a power for conservation greater than laws, creeds or precepts. Found on every Axelson Sucker Rod at every Frick-Reid Store.

Frick-Reid
Supply Co.

Tulsa, Okla. Pittsburgh, Pa.

West of the Mississippi, Stores Everywhere
East of the Mississippi, The Frick & Lindsay Co.



Years of Metal Packing Experience

Years of Experience Garlock metal packings are mechanically right from the standpoint of design and service. Their efficiency is the result of *twenty-five years of manufacturing experience* coupled with careful surveys made by our engineers to determine the proper designs for work against high temperatures and pressures existing in modern power units.

Research Department Our Research Department gives special study to the mechanical details of the packings; we also maintain chemical and physical laboratories to determine different composition of alloyed metals in reference to their hardness and wearing qualities.

Use of Metal Packings The use of metal packing is not limited. It will give superior and economical service in certain classes of mechanical equipment when used on valve stems and steam, air, gas, and ammonia piston rods.

Consultation Service As a part of our metal packing service, we maintain a Corps of Metal Packing Engineers who are at the call of our customers for consultation on special or difficult metal packing problems.

Garlock Metal Packings

THE GARLOCK PACKING COMPANY, PALMYRA, N. Y.
—Sales Offices in Principal Industrial Centers

as it is held against the pumping equipment only.

Removing Paraffin From Pumping Wells

A paraffin hook can be run into the tubing on the rods after they have been pulled and the working valve removed. It is only necessary to run the tool to the depth at which the paraffin showed on the rods. When the tool is pulled from the well, it will bring all the accumulated paraffin with it. This operation can be done with the usual portable winch used for pulling rods, or with the drilling engine if the well is rigged up.

Hot solvents, such as kerosene, crude oil or gasoline, can be run into the well through the casing and pumped out through the tubing. It is difficult, however, to heat the solvent sufficiently to dissolve the paraffin deposited in the tubing in this manner. The cost of this method is prohibitive in most cases, as the rods can be pulled and a paraffin hook used with less special equipment and expense.

When large quantities of casinghead or drip gasoline are available, they can often be used for dissolving the paraffin by putting several barrels into the well and then circulating the oil for several hours by connecting the tubing into the casing. The crude oil and gasoline will successfully remove the paraffin, providing they are circulated in this manner for several hours, in order to allow them time to dissolve it. This method is applicable only where the gasoline is available at a very low cost.

Certain chemicals for removing paraffin are on the market. Most of these react with water to generate heat—700 to 800 B.t.u. per pound. The chemical is usually run into the well between the tubing and casing and allowed to react at the bottom of the well. This heats the oil, which in turn dissolves the paraffin from the tubing as the oil is pumped through it. Unless a large quantity of chemical is used, the oil will not be heated sufficiently to dissolve the paraffin. It is cheaper to remove the paraffin from the tubing of pumping wells by pulling the rods and using a paraffin hook.

Deposition on Face and in Pores of Sand

The accumulation of paraffin on the face or in the pores of the sand decreases the amount of oil that can enter the well. This particular phase of the paraffin problem is one of the most serious, because it usually occurs in old wells of small production, in which it is often doubtful whether the increased production obtained by removing the paraffin will justify the expense incurred.

The temperature of most producing oil sands is above that at which the original oil is saturated with paraffin. Any deposition of paraffin on the face or in the pores of the sand is therefore the result of evaporation and cooling of the oil as it flows through the sand or into the well. As a field is produced the remaining oil in the sand steadily becomes heavier, due to the loss of the lighter constituents. As an example of this, the initial boiling point of oil from the second sand at Salt Creek increased from 98 degrees to 103 degrees Fahrenheit in 1922, to 116 degrees Fahrenheit for 1924, and 142 to 144 degrees Fahrenheit in 1926. It is also of interest to note that no vacuum has been used in this field during that time. It is possible, in fields where vacuum has been used for a long period of time, that a sufficient quantity of the lighter constituents have been removed so that the oil adjacent to the well is unable to hold all of the paraffin in solution, and it has crystallized out and caused the oil to congeal in the pores of the sand. It is also possible that in many fields the gas flowing through the upper part of the sand, after the oil has been partially depleted, has evaporated the remaining oil in this part of the sand until it has reached the point where paraffin has been precipitated and caused the oil to congeal and plug the pores of the sand.

In fields where the oil is unsaturated with paraffin at the temperature of the sand, there will not be any accumulation of paraffin, provided the fluid level is maintained at the top of the sand, as the temperature of the oil in the well will be very nearly the same as the temperature of the sand. Any gas being produced with the oil cannot cool it very much, because it does not do any appreciable amount of work on the oil at this point. In most cases, the gas does not expand suddenly upon entering the well, but gradually expands as it flows through the pores of the sand in approaching the well; therefore very little cooling can result from this source. In addition to these conditions, it is improbable that any wax would be deposited on the sand, providing the fluid level was constantly maintained at or above the top of sand, even providing the oil were cooled and evaporated so that it contained suspended paraffin. Laboratory tests have shown that paraffin will remain in suspension if there is sufficient oil.

The accumulation of paraffin on the face of the sand probably takes place in wells in which the fluid level is maintained at the bottom of the sand. In flowing over the face of the sand in a thin film the oil may be evaporated to such an extent by the gas being produced that it cannot hold all the paraffin in solution, and some will crystallize out. In wells where vacuum is used, a greater evaporation of the oil takes place. In the laboratory, it has been observed that when oil, containing small suspended particles of wax, or other substances, flows over a surface in a film thinner than the diameter of the particles, these particles stick to the surface.

The raising and lowering of the fluid level by intermittent pumping should not result in the deposition of paraffin on the sand unless the oil is saturated and contains suspended particles of paraffin. If the oil is not saturated with wax, it will have a tendency to dissolve any paraffin that has been deposited on the surface of the sand while it was covered with only a thin film of oil.

Preventing Accumulation of Paraffin on Face

If possible, the fluid level should be maintained at the top of the sand at all times. This will prevent the accumulation of paraffin on the face of the sand, even though the oil contains suspended particles of paraffin, as this suspended paraffin will not have an opportunity to become firmly attached to the sand. If the oil that accumulates with intermittent pumping is saturated and contains suspended particles of wax, the alternate covering and exposing of the sand will have a tendency to increase the deposition of paraffin.

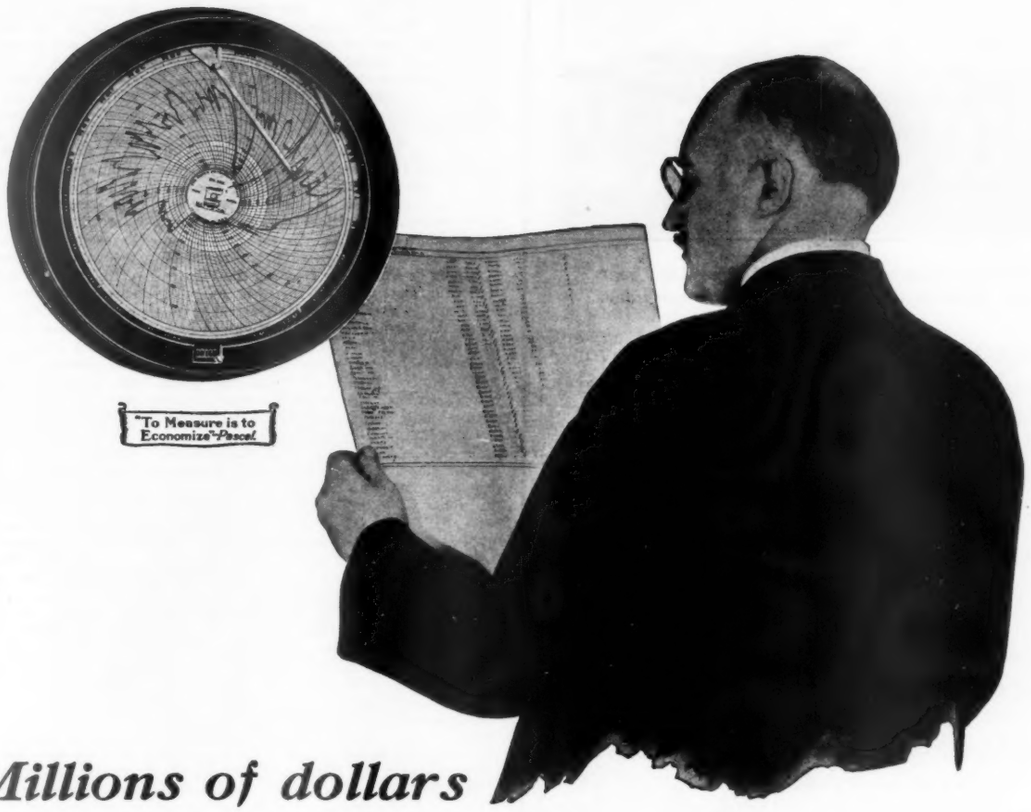
In some fields, the producers are putting back into the sand the vapors that are made when the gasoline is weathered. These vapors, when dissolved in the oil remaining in the sand, increase its ability to hold paraffin in solution and therefore tend to prevent its deposition in the pores or on the face of the sand.

If tools are used to remove paraffin from the casing or tubing, care should be taken not to force a large quantity of it down into the bottom of the well where it may plug the sand. When heat is used to melt the paraffin in casing or tubing, the paraffin may run down and plug the sand; however, if the sand is covered with oil, this will usually be prevented, as the wax will be dissolved or remain suspended in the oil.

Electric Heaters for Use at the Face

In most cases, heat or solvents are used, either combined or separately, to remove paraffin that has been deposited on the face or in the pores of the sand.

Electric heaters can be used if they can be lowered into the well, either on a wire line or on the end of the tubing; the latter will allow the well to be pumped while the heater is in operation. The sand should be covered with oil while the heater is in use, so that it will dissolve the paraffin and carry it in suspension to the top of the well, instead of allowing it to melt and accumulate in the bottom of the well, where it might congeal when the heater is turned off. Kerosene or crude oil can be added if the fluid level will not come up to the top of the sand, or if it cannot be maintained while the well is pumping. A temperature slightly above the melting point of the paraffin should be used, as this will



Millions of dollars in coal and oil burned by refineries yearly . . . Much of this can be saved!

You do burn a lot of gas and heavy ends that don't count, that's true—but records show, too, that millions of dollars worth of COAL and FUEL OIL are burned yearly under oil refinery boilers.

Millions of dollars worth . . . and a huge part of it WASTED for lack of proper boiler room instruments. While stills and towers are equipped with the necessary instruments, boiler house operators are only too often obliged to run by guess.

It has been estimated that in the average steam plant an installation of Brown Electric Flow Meters pays one hundred times its cost.

5 EXCLUSIVE ADVANTAGES

1. Inductance Bridge Circuit.
2. Automatic Planimeter Record.
3. Inherently independent of voltage fluctuations.
4. No electrical parts in pressure chamber. No mechanical parts going out of it.
5. Double-range Manometers.

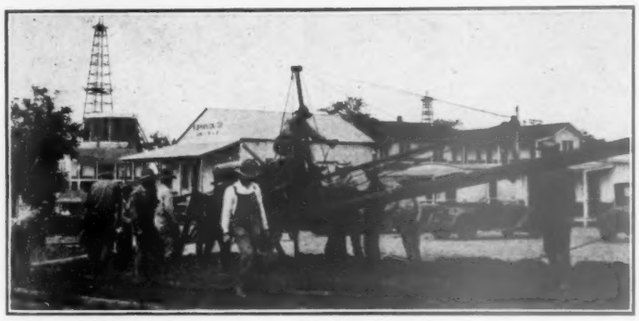
Think this over.

Write for details, and Catalog No. 20. The Brown Instrument Company, 4412 Wayne Ave., Philadelphia, *Branch Offices in 18 Principal Cities.*

Measure steam, water, gas and oil

Brown Electric Flow Meter

on the Inductance Bridge Principle



Photograph showing construction of Gulf Pipe Line near Seminole, Okla. Machine laying 400 to 500 joints every day.

One of our machines has record of laying over three miles of 8 inch pipe in one day. Another laid 8000 feet of 10 inch pipe and another laid 7000 feet of 12 inch pipe in one day's run. The work was perfect. There were no leaks or breaks in lines.

With our machine the necessary bends are made "right now." Even 10 and 12 inch pipe is BENT COLD.

Machines for laying all sizes from four to twelve inch pipe for sale or lease.

CALIFORNIA PIPE LINE MACHINE CO.
Kansas City, Mo.

Double Unit Filter

There is a BURT Oil Filter to meet the needs of every Refiner. Built with the experience of over 36 years as the Pioneer Manufacturer of Oil Filters.

The Burt Double Unit Type, filters two kinds of oil SIMULTANEOUSLY. Due to recent changes we can give increased capacity in our Unit Filters at no increase in cost.

Write for complete catalog. Any type filter will be furnished on a 30 day free trial basis.

Do You Burn Fuel Oil?

If so we can keep your burners free from grit or dirt, hence insuring perfect combustion and a clean steady flame at all times. Specially designed and packed Burt filters do the work—write for details.

Crankcase Oil Can Be Reclaimed

so as to give same efficient service as regular fuel oil and at practically no cost.
Service stations would probably be glad to have you haul it away. Also provides storage capacity which can be increased if necessary with a Burt Oil Reservoir.

THE BURT MANUFACTURING COMPANY
929 S. High St., Akron, Ohio
Pioneer Oil Filter Manufacturers

insure immediate solution of the paraffin in the oil that is being produced by the sand or being added to the well.

By means of a 20-kilowatt-hour heater, the oil in the bottom of a well having a normal temperature of 103 degrees Fahrenheit was raised to 220 degrees Fahrenheit. This temperature was maintained for several days and then the heater was turned off. The sand was heated sufficiently so that the temperature of the oil did not cool to 103 degrees again until the seventh day after the heater was turned off.

Figuring power at 1¼ cents per kilowatt-hour, this heater would cost $6 per day to operate. This method of heating the sand is probably the cheapest and most economical method of removing paraffin that is deposited on the face or in the pores of the sand adjacent to the well.

Steam or Flame for Heating the Face

Steam also is used for this purpose. It is not as satisfactory as electricity because it does not obtain the required temperature so easily. The steam also cuts the oil badly and often causes caving of shale breaks within or above the sand, which necessitates cleaning with tools after the steaming operation is completed. As a general rule, when steam is used, it is carried to the bottom of the well in tubing and is there released. Superheated steam was used in a well similar to the one in which the electric heater was used. The steam had a temperature of 740 degrees Fahrenheit as it entered the well, and the temperature at the bottom of the well was approximately 230 degrees Fahrenheit. The well had two strings of tubing and was pumped continuously while it was steamed. A temperature of 230 degrees Fahrenheit would melt any paraffin that might be present in the sand or in the pores adjacent to the sand, but the cost of operating steam equipment for that temperature is much greater than that of operating electric heaters, and much better results can be obtained with the latter.

Another method of heating the sand is by the use of a flame. A string of tubing with a burner attachment is lowered into the well and a proper mixture of air and gas to sustain combustion is pumped down the tubing. The gas is ignited at the bottom, either by an electric spark or by a flare lowered into the well. A small burner at the top of the tubing indicates whether the requisite proportion of air and gas are being used.

Undoubtedly, a high temperature can be obtained by this method, but it is questionable whether it accomplishes the desired results. In very small wells, the oil that accumulates during the burning operation will be burned; but in larger wells, there is a probability of a thick, tarry residuum remaining in the well after the burning operation is completed. It is also possible that the lighter constituents of the oil in the pores of the sand will be distilled off, leaving a heavy residue that will remain in the pores and plug them. It is also possible that this high temperature will tend to change the character of the sand and reduce the size of the pore openings. After using the flame, it might be advisable to add several barrels of kerosene, gasoline or crude oil to dissolve any thick residue that might remain in the well or that might flow from the sand while it is still hot. the actual cost of operating this method is somewhat less than that of the steam method but greater than the electric. The method is patented, and in addition to the cost of operation a royalty agreement must be made before it can be legally used.

Circulation of Hot Oils or Chemicals

The circulation of hot oil is often used to heat the sand and dissolve the paraffin. Generally, the well is connected to a tank containing steam coils; the oil is pumped into the tank and heated, then is allowed to run back into the well between the casing and tubing. Gasoline, kerosene, or other oils are often added to the crude oil that is circulated in order to increase the solubility of the paraffin. Providing the oil is hot enough and the operation is continued for a sufficient length of time, paraffin will be removed, but the method is not recommended.

Chemicals that generate heat may often be used to advantage in removing paraffin from the face of the sand. It is advisable to have the sand covered with oil. The chemical heats the oil; the heated oil dissolves the wax, and can then be pumped from the well. If the chemical is used without an appreciable amount of oil in the well, the paraffin may be melted and cooled again before it can be removed by pumping or it may congeal in the tubing while being pumped from the well. When the chemicals are properly used, satisfactory results can often be obtained at a moderate cost.

Compressed Air or Explosives

The use of compressed air alone for removing paraffin may result in forcing the paraffin into the pores of the sand instead of removing it. If hot gasoline, kerosene or crude oil is first added to the well and allowed to dissolve the paraffin, the air can be used to remove the solvent and any loose sand, silt, etc., that might be in the well. Compressed air can also be used in connection with revolving reamers that cut away the sand. The tool removes the paraffin and cuts away the sand that might be plugged by the paraffin and the air carries the loosened material from the well.

The value of explosives for removing paraffin is questionable. The pressure created by the explosion might force the paraffin more firmly into the pores of the sand, or it might shatter the sand so that a layer of the surface would be removed, taking the paraffin with it.

Paraffin Troubles in Flow Lines

Two distinct problems are encountered in flow lines. The first is the deposition of paraffin as a hard layer inside the pipe, gradually increasing and closing it. The second is the congealing of the entire body of oil in the flow line. These conditions usually are met in the colder periods of the year.

The accumulation of a hard deposit of paraffin generally occurs in flow lines of wells that are producing by heads, and where excessive quantities of gas are being produced. It also occurs in the flow lines of pumping wells, where the casinghead gas is connected into the flow lines. This type of paraffin is the result of the same conditions that cause the trouble in the well, and it is necessary to prevent these conditions in order to overcome the trouble. This can be accomplished by using a gas and oil separator at the well and keeping the flow line of oil at all times. In pumping wells the casinghead gas should be run through separate lines, to prevent the formation of hard paraffin deposits in the flow lines.

If it is impractical to separate the oil and gas at the well and prevent the accumulation of paraffin, it is necessary to remove it from the lines before the accumulation reaches the point where it seriously retards the flow of oil. This can be accomplished by running a flexible scraper through the lines occasionally. A ball of newspaper or heavy wrapping paper inserted in the flow line at the well makes an excellent scraper; the oil will force it through the line and it will remove the paraffin. When the accumulation is too hard and extensive for this scraper, it can best be removed by running steam through the lines.

The congealing of the entire body of oil in the flow lines is caused by the cooling of the oil below its pour point. If the oil is kept moving it will not congeal at as high a temperature as when standing still, but even when kept moving it will become viscous or congeal if cooled sufficiently.

This trouble can often be overcome by using large flow lines and having the tankage near enough to the well so that the oil will reach the tank before it is cooled sufficiently to congeal. When this is not practical, it is necessary either to prevent the cooling of the line or to heat the oil.

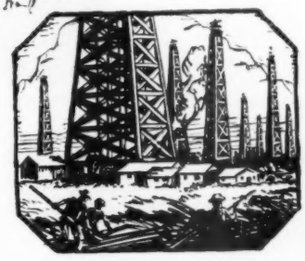
There are two general methods of preventing the line from becoming cooled below the pour point of the oil. The first is to bury the line deep enough so that it will not be appreciably affected by atmospheric temperature changes; this is usually impractical under oil field conditions. The second method is to box a steam line with the flow line. The oil line can then be heated whenever neces-

In 1859—

And Now!

In 1859 good tools were not to be had. Today with the aid of better tools oil is being produced in enormous quantities.

Tools made of ASCO Steel have been reducing costs because of their strength, temper and long wearing qualities. These characteristics have been developed after years of study and research. We know STEEL and can help you in the production of better oil well tools. Write for further information.



"A Story of Steel and Oil" is a historical sketch of the Petroleum Industry. Write for your copy today.

ASCO STEEL

STANDS SUPREME

THE ANDREWS STEEL CO.

NEWPORT ◆ KENTUCKY

IT PAYS TO BUY GOOD TOOLS

What Billy Beaver Thinks About Standardizing

A good thing—this standardization business—but I guess it falls short of the goal pretty often.

Now they tell me standardization pays big returns—of course that means money returns—because it makes dollars and pennies go farther and cause less fuss in the going. Well, if that's the goal of standardization I guess the folks who buy equipment that pays a big profit by saving time and labor have a big start on the other fellows.

Now take Beaver Die Stocks. They are money makers because they save time and labor. They are self-contained, and so folks don't fritter away minutes hunting for loose parts.

I've put a few Beavers on display here—sorry I couldn't put 'em all out where you could see them—but then I've got a dandy little Booklet—No. 19—that tells all about the whole 26 of 'em. Write me for a copy.

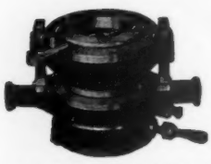
BILLY BEAVER
The Borden Co.
514 Dana Ave., Warren, Ohio

NO. 6 BEAVERETTE
¼ to ¾ Adjustable

Fits your hand—and always ready. Set the dial to size and cut your thread while hunting for die and bushings in other tools. Fully described in Booklet No. 19.

NO. 41 BEAVER
2½ to 4 inch

Another adjustable tool. Set the dial to size and it's ready. Narrow receding dies, power reducing gear and ratchet handle make 4 inch easy threading. No. 61—2½ to 6 inch; No. 80—4½ to 8 inch and No. 90—9 to 12 inch are of same design—and adjustable. All are one man tools.



NO. 26 BEAVER RATCHET
1 to 2 inch adjustable

A dandy tool. The old stand-by wherever oil flows through pipe. Always ready. Set the dial and go ahead. Universal chuck—no loose bushings. A husky tool that's equal to the hard use tools get in the oil fields. Narrow receding dies make 2 inch threading a dead cinch. No. 25 is just like it but does not have the ratchet. No. 19 Booklet tells all about No. 25 and No. 26.

NO. 44 BEAVER
Power Drive

Oil fields are using this handy machine in salvage work. Cuts up to 12 inch; threads up to 6 inch. Makes power machines of any make of hand tools. Powerful, portable, economical and dependable. Attach it to any light socket. Compact and rugged. Safe to use—the pipe revolves the tools stand still. Let No. 19 Booklet tell you all about it.

Can't show the pipe cutter in this booth but if you'll write for No. 19 Booklet you'll learn all about standardizing on Beavers.

Sincerely,

BILLY BEAVER.

BEAVER

Time and Labor Saving Die Stocks, Pipe Cutters and Power Drives

sary. This method is expensive, but it is one of the surest methods of preventing this trouble, and is widely used.

When there is an oil and gas separator at the well, steam coils can be used in the separator to heat the oil, but this method is likely to cause excessive evaporation of the oil and a loss in gravity. The oil can also be heated by running through a steam heater or heat exchanger, usually consisting of a small pipe inside a larger one, the oil running through the smaller pipe and the steam in the outside or larger pipe. In some fields, gas heaters, and in a few instances, electric heaters, are used. When the flow line is long several heaters may be necessary to keep the oil heated above the congealing point. These heaters are satisfactory, providing the oil is kept moving; but when the well does not produce continuously they often fail. When the flow of the oil stops, the portion between the heaters will cool off and congeal, if the atmospheric temperature is low enough. It is advisable, therefore, where the oil is not moving continuously, to provide a method of heating the flow line throughout its entire length or to bury it.

Paraffin Troubles in Pipe Lines

Paraffin is seldom deposited as a hard layer in pipe lines, but the oil will congeal. This trouble can be partly or entirely prevented by burying the line, but in handling oils that congeal at a comparatively high temperature, it is necessary to heat the oil at various points along the line. If the oils are heated to a temperature above the melting point of the waxes that they contain, the point at which they congeal will be considerably lowered, and they will not return to their original pour point for a number of hours; in some instances, not for days. The fact that the pour point can be lowered in this manner makes it possible to handle some oils that could not otherwise be run through the lines during the winter months except by using a great number of heaters or by burying the lines 8 or 10 feet, the expense of which would be prohibitive.

Occasionally paraffin does settle out of the oil and accumulate in the bottom of the lines as a soft, granular mass; but it does not become firmly attached to the pipe, and the quantity is seldom sufficient to cause trouble. Silt, sand, etc., also accumulate, and it is advisable to run scrapers through the lines at regular intervals to prevent the building up of large quantities of refuse.

Paraffin Troubles in Storage

When oils containing a large amount of wax are placed in storage, the wax slowly settles out of the oil and accumulates as a thick, granular mass in the bottom of the tank. This also occurs sometimes while oil is being shipped in tank cars. Usually it is mistaken for emulsion, especially where some emulsion is also present. This accumulation of wax is caused by the fact that the average daily temperature of the oil is below the point at which it is saturated with wax, and the excess crystallizes out of solution and settles to the bottom of the tank.

After oil has stood in storage for a long period of time and the excess wax has been allowed to settle out, the pour point is considerably lower than it was with the fresh oil. If this paraffin is not put back into solution, it represents a loss as tank bottoms, because few, if any pipe lines will accept it, even if it does not contain any water, as it would settle out in the lines and cause considerable trouble. It is advisable, therefore, to put it back into solution in the oil, either before or while running the oil from storage. This can be done by removing the tank bottoms from the tank and heating them to a temperature sufficient to cause all the wax to melt and go into solution in the oil associated with it, and then mixing this heated wax with the oil from which it separated. If there is also considerable emulsion, the water must be removed before the oil is returned to the larger body of oil. This can usually be accomplished by heating the bottoms, consisting of oil, wax and emulsion, and adding a chemical. Upon running this heated oil into the bottom of a tank partly filled with hot, fresh water, the emulsion will break down, and clean oil can be taken from the top of the tank. Care should be taken not to add too great an amount of the treated oil to the original or to fresh oil, as this may cause the wax to settle out again very rapidly. It is advisable to use vapor-tight heaters and tanks while treating these tank bottoms, to prevent evaporation losses.

Summary

In this paper, the writer has tried to discuss the most important problems encountered in producing oil of high-paraffin content, and also the most satisfactory methods of preventing and handling these conditions. It is impossible in so short a paper to discuss in detail all the various problems and different methods that have been tried or used to overcome paraffin deposits.

COMPETITION IN ROCKIES BRINGS LOWER PRICES

(Continued from Page 180)

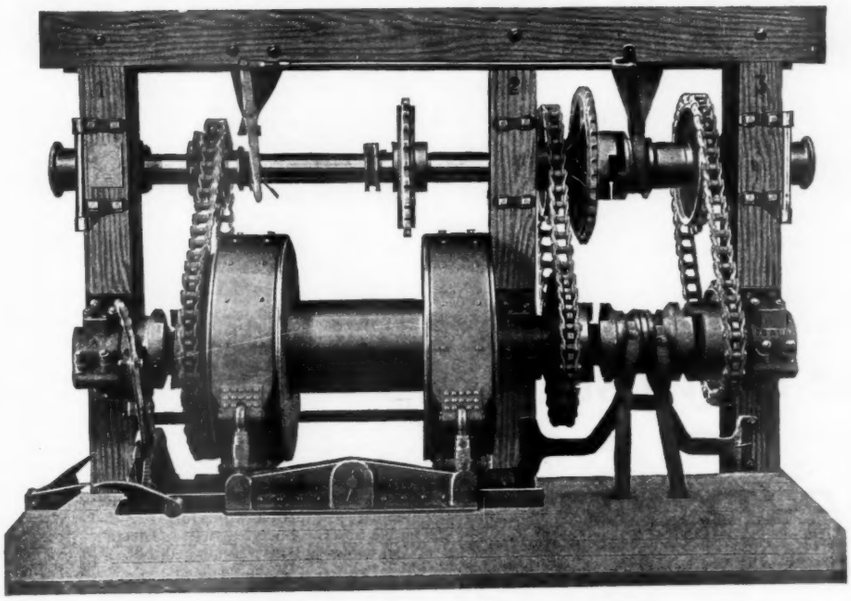
small shipments from California. This compares with 28,282,536 gallons or 77.6 per cent from the Rocky Mountain States in the first six months of 1926, and 11,000,857 gallons or 22.4 per cent from the Mid-Continent States.

This condition continued up to within a few weeks ago, when the Navy Gas & Supply Co., which jobs Shell gasoline from the Mid-Continent Field in this territory, and which has 250 outlets in the state, is said to have entered into a contract with the Shell-Union Oil Corp. whereby the price paid for gasoline is based on a certain per cent of the retail price. Whatever the facts were, the result was that the Navy company cut its service station price to 18 cents from 20 cents. This was followed by the Continental, Texas, Sinclair, Denver Powerine (Producers & Refiners) and others meeting the cut. The Denver Union Oil Co. then cut its price to 16 cents, which was met by the Navy company, and in turn by the others. At this time all companies are retailing at 16 cents, including 3 cents state tax. This led to rumors of a price war, but officials of companies involved discredit any such report. One Mid-Continent refiner points out that it costs his company 13.28 cents per gallon to deliver gasoline at the pump in Denver, which with 3 cents state tax added, indicates that gasoline is being sold at a loss.

When the Standard of Indiana acquired control of Midwest Refining, the former, which is one of the largest marketers through service stations in the Central West, did not extend its retail business to the Rocky Mountain area. The Continental continued to be a large customer of the company, still is, and expects to continue, their relations being friendly. However, the Continental expanded into the producing and refining field in the meantime and is less dependent than formerly upon other refiners for its requirements.

While Midwest officials will neither confirm nor deny the report, it is logical to assume that the Standard-Midwest interests would move in a situation of this kind to protect their natural distributing territory and enormous investment at Casper. The Vickers Petroleum Co. has been active in acquiring service stations in this territory, has recently purchased the Jewell Oil Co., of Pueblo, the Platte-Cascade Co. of Colorado Springs, the V. S. Allen and Wolf & Son stations in northern Colorado, and others, giving the company more than 115 outlets. Close to $1,000,000 is said to have been involved in the deals. Some of the stations acquired were among those that marketed Mid-Continent gasoline at cut prices. If the Standard-Midwest interests are behind this move, as reported, it is construed to mean that Red Crown gasoline products will be introduced here and that Standard of Indiana will take a prominent place in the distribution at retail of products of the Casper refineries. If conditions that have developed could have been foreseen, it is probable that the trunk line from Wyoming to Missouri might have taken precedence over the

Gumbo Buster
78A Model Draw Works



Front View Gumbo Buster 78A Draw Works.

A Draw Works Designed for Present and Future Deep Drilling

1. Three Speeds
   Third speed is a time and engine saver.
2. Shafts
   8″ drum shaft and line shaft of high carbon alloy steel.
3. Clutch Blocks
   Made of cast electric steel, and fool proof.
4. Brakes
   Front equalized floor type with 12½″ solid asbestos brake lining.
5. Drum Spool
   20″ in diameter and 29″ long.
6. Bushings
   High grade phosphor bronze extra long and keyed to shaft.
7. Lubricators
   Alemite lubrication on all loose sprockets.

Sold Exclusively By

Republic Supply Company

GENERAL OFFICES - HOUSTON, TEXAS

OIL AND GAS WELL SUPPLIES

ROTARY AND CABLE TOOLS

You Can Bet

on the equipment of these manufacturers—

American Well & Prospecting Co.
Boykin Machinery & Supply Co.
Hopper Machine Co.
Latex Iron & Steel Works, Inc.
Lee C. Moore & Co.
Lucey Manufacturing Co.
Oil Well Supply Co.
Portable Rotary Rig Co.
Star Drilling Machine Co.

Because they use

AMERICAN
HEAVY DUTY TYPE "C"
ROLLER BEARINGS

Ohio Tracktruck

For Oilfield Transportation

where the going is hard. CAPACITY TEN TONS. Over ten square feet of traction and load carrying surface. Powered by the sturdy Fordson.

Manufactured by

The Traction Machine Company
North Baltimore, Ohio

large investment in refineries in this territory, but since that was impossible, it seems that the companies have taken a forward move to protect themselves and overcome as far as possible a disturbing situation.

REVIEW OF RECENT LEGISLATION AFFECTING GASOLINE TAXATION

By Edward Martin*
Auditor General of Pennsylvania

I have been asked to make a review of recent legislation affecting gasoline taxation and to discuss the same. This is rather a difficult task. It is our newest form of taxation and there is much experimenting and many new laws. When it is considered that Oregon, the pioneer gasoline tax state, only enacted its law in 1919, and since that time every state in the Union, excepting New York and Massachusetts, have imposed such taxes, the rapidity of the movement is at once noted.

Probably the most important gasoline legislation last year was the entry to New Jersey and Illinois to the list of states taxing liquid fuel.

In 1926 the rate of gasoline tax varied from 1 cent to 5 cents per gallon; two states, Rhode Island and Texas, collecting 1 cent, and two states, Kentucky and South Carolina, 5 cents.

The following, showing rates in 1926, is of interest:

2 states	had	.01	cent gasoline tax
21 states	had	.02	cents gasoline tax
1 state	had	.02½	cents gasoline tax
9 states	had	.03	cents gasoline tax
3 states	had	.03½	cents gasoline tax
5 states	had	.04	cents gasoline tax
1 state	had	.04½	cents gasoline tax
2 states	had	.05	cents gasoline tax

Now the number of states collecting a 2-cent tax has decreased from 21 to 13, and the number collecting a 3-cent tax has increased from 9 to 16. Ten states assess a 4-cent tax as compared with 5 in 1926. The average rate of tax for 1926 for 44 states and the District of Columbia was .02677, while for 1927 the average rate for 46 states and the District of Columbia had increased to .03148.

Increase in Tax

The increase of the tax during the year is as follows:

	1926	1927
Alabama	.02	.04
Arizona	.03	.04
Arkansas	.04	.05
California	.02	.03
Colorado	.02	.03
Delaware	.02	.03
Florida	.03	.05
Georgia	.03½	.04
Idaho	.03	.04
Iowa	.02	.03
Maryland	.02	.04
Michigan	.02	.03
Montana	.02	.03
New Hampshire	.02	.03
New Mexico	.03	.05
Pennsylvania	.02	.03
Rhode Island	.01	.02
Texas	.01	.03
Vermont	.02	.03
West Virginia	.03½	.04
Wyoming	.02½	.03

License Fees

This shows that 21 states have increased the tax during the year. In addition to the gasoline tax as is now imposed by the various states, the following states exact a license fee:

Florida a license fee on $5 from every dealer in addition to the 4-cent gasoline tax.

Colorado a license fee annually of $1 from every distributing station, in addition to the 3-cent gasoline tax.

Mississippi an annual privilege tax on each person, firm or corporation selling gasoline and oil and fuel for motor vehicles, in addition to the 4-cent gasoline tax.

In cities of 20,000 inhabitants or more, $20.

In cities of 10.000 and less than 20,000 inhabitants, $15.

In cities of 5,000 and less than 10,000 inhabitants, $12.50.

In cities of 2,000 and less than 5,000 inhabitants, $10.

In cities of 500 and less than 2,000 inhabitants, $7.50.

In all other places, $5.

Ohio a filing fee of $5 for filing certificate, in addition to the 2-cent tax.

New Jersey an annual license fee of $2 from every person engaged in selling of gasoline, in addition to the 2-cent gasoline tax.

Tennessee an annual special permit of $10 for the wholesale marketing of gasoline, and $1 for each retail station or curb pump, in addition to the 3-cent tax.

Price Regulation Blocked

The Tennessee Act of April 8, 1927, which undertook to regulate the prices at which gasoline shall be sold in the state was declared unconstitutional, the courts holding that the main purpose of the act was to regulate the price of gasoline, and, therefore, the whole act was unconstitutional. This act contained the license fees named above.

West Virginia an annual license tax of $5 for each distributing station, and an annual license tax of $1 for each filling station or place of business. Also every other retail dealer shall pay an annual license tax of $1 for each filling station or place of business, in addition to a 4-cent gasoline tax.

The changes and innovations in gasoline tax law brought about by recent legislation of the various states, except increases of rate, are as follows:

Arizona exempts from the tax all motor vehicle fuel imported into the state in interstate or foreign commerce and intended to be sold in the original and unbroken tank cars or other original receptacles, and so sold while the same are in interstate or foreign commerce. It also exempts fuel sold to the United States Government and provides for a refund of the amount of tax paid by rural mail carriers on the gasoline used exclusively in delivery of the mail. Act of 1927.

Report by Manufacturer

Arkansas requires that the report to be made by manufacturers contain the name of the purchaser from the manufacturer, date of purchase and shipment of the gasoline, number of car in which shipped by rail, name of boat if shipped by water, or if sold to retail dealer, by means of automobile, truck or wagon, license number of truck, etc., and other minute details. Act of 1927.

California tax is a lien upon all the property of the distributor. It shall attach at the time of the delivery or distribution and shall have the effect of an execution duly levied against all the property and shall remain until the tax is paid or the property is sold for the payment thereof. Act of May 23, 1925.

Colorado makes it unlawful for any common carrier to import into the state gasoline subject to tax without receiving from the consignee or consumer a written statement endorsed upon the way bill, that he or they will pay or have paid all taxes due. Act of April 20, 1927.

Connecticut provides for a permit to make sales without tax of gasoline to firms who will use it commercially or in manufacturing, and also requires a bond of $10,000 from all distributors before a license is issued. Act of June 1, 1927.

Delaware reimburses a purchaser with the amount of tax paid on gasoline used in stationary gas engines, farm tractors, motor boats, airplanes, or cleaning or dyeing. Act of March 22, 1923.

Division of Tax

Florida 3 cents of the tax is to be paid to the State Road Department, 1 cent equally divided between the counties of the state, and the extra cent is to be used for education. Two-thirds of this amount is to be placed in the Public School Free Fund and to be distributed to the Public Free Schools of the state. The remaining third is to be placed in a special fund known as Permanent Building Fund for State Institutions of Higher Learning, experi-

*Before North American Gasoline Conference, Columbus, Ohio.

The Insides— CAN'T PULL OUT...

—Cutters do not Lose!

The insides cannot pull out of the GUIBERSON Underreamer because the sturdy tongue which holds the insides is integral with the head, forged from a solid steel block.

Cutters do not pull off because they are extra strong, and interlock securely with the head, removing all strain from the bolt while underreaming.

Elimination of ALL characteristic underreamer weaknesses has won for the GUIBERSON the title of "The World's Strongest Underreamer." Users will tell you this underreamer is as strong and rigid as a drilling bit. Patented.

"Better Be Safe Than Sorry"

THE GUIBERSON CORPORATION
Box 1106, Dallas, Texas
CALIFORNIA BRANCH: 1506 Santa Fe Ave., Los Angeles

402 W. First	321 S. Osage	506 Trust Bldg.
TULSA	PONCA CITY	NEWARK, O.

GUIBERSON

BETTER BE SAFE THAN SORRY

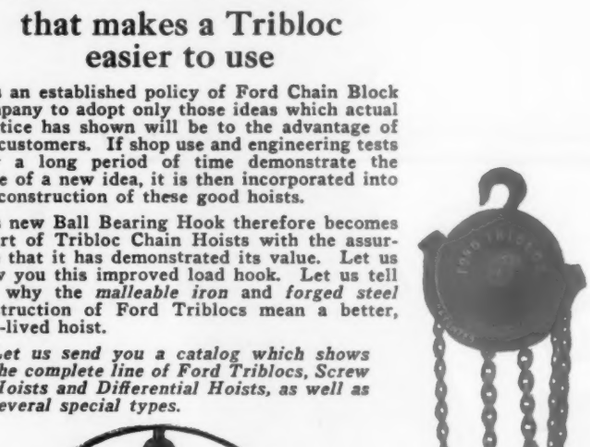
An Improvement

that makes a Tribloc easier to use

It is an established policy of Ford Chain Block Company to adopt only those ideas which actual practice has shown will be to the advantage of our customers. If shop use and engineering tests over a long period of time demonstrate the value of a new idea, it is then incorporated into the construction of these good hoists.

This new Ball Bearing Hook therefore becomes a part of Tribloc Chain Hoists with the assurance that it has demonstrated its value. Let us show you this improved load hook. Let us tell you why the *malleable iron* and *forged steel* construction of Ford Triblocs mean a better, long-lived hoist.

Let us send you a catalog which shows the complete line of Ford Triblocs, Screw Hoists and Differential Hoists, as well as several special types.



The cut at the right shows the standard Tribloc in the ¼ to 2-ton size. At the left is shown the new Ball Bearing Load Hook.

FORD CHAIN BLOCK COMPANY
Second and Diamond Streets,
Philadelphia, Pa.

"John Crane" Metallic

Craneum for Gas Lift Compressors

Many refinery superintendents have been surprised at the long trouble-free service of "John Crane" Style 250 on gas lift compressors, centrifugal pumps handling crudes, oils or distillates and on hot oil plunger pumps. Temperature to 1,500° F. Pressures to 2,000 lbs. Made of Craneum, the ideal mixture of metal particles, high temperature materials, graphite and binder in a braided copper jacket.

Where asbestos packing gave brief and uncertain service, "John Crane" Style 250 in some cases has lasted *twelve times* as long. It runs without wear or friction on rods or shafts—no smoke, no leakage.

Order now through your jobber or direct.

CRANE PACKING COMPANY

1819 Cuyler Ave. . . . . . **Chicago**

109 Broad Street, NEW YORK
616 Mission Street, SAN FRANCISCO
2005 Cedar Springs Road, DALLAS
Whealton & Townsend, TULSA

ment stations and other institutions under the management of the State Board of Control. This is an entirely new use of the fund. Georgia has a similar law giving one-half cent per gallon to the public schools. Act of May 30, 1927.

Georgia requires a bond of $25,000 from every distributor. However, when a distributor collects less than $25,000 per month in taxes due the state his bond may be fixed in the discretion of the Comptroller-General of the State. Act of August 24, 1927.

Illinois enacted its first gasoline tax and joined the other states under date of June 29, 1927, the act being effective August 1, 1927. A provision of the act provides that where a person shall receive motor fuel under such circumstances as preclude the collection of the tax from the distributor (this being the person from whom the tax is collected), and such person thereafter sells or uses the motor fuels under such circumstances as may subject such sale to the tax power of the state, then such person shall be considered a distributor and be subject to all the provisions of this act. Act of June 29, 1927.

Kentucky Penalty

Kentucky has the heaviest penalty for failure to comply with the law. In the act approved February 19, 1927, a penalty of 20 per cent is imposed for refusal to make return or pay tax on time, together with 6 per cent interest. An additional 20 per cent is imposed if collection is made by court proceedings. Act of February 19, 1927.

Maryland's laws provide that persons using motor vehicles registered for use in transportation of persons for hire, shall be reimbursed and repaid 1 cent per gallon for each gallon of motor fuel so used, provided the vehicle is operated exclusively in Baltimore City or any other incorporated city or town in Maryland. Act of April 1, 1927.

Michigan's law provides that where a license has been revoked, the distributor must file a bond before he is entitled to apply for a license and shall also pay all delinquent taxes, penalties and costs. The tax becomes a preferred lien against all the property of the person liable for the tax. Act of May 12, 1927.

Minnesota amended its act providing for a penalty of 10 per cent and interest at the rate of 1 per cent per month on amount of tax that has not been paid when due, and also that the tax, penalty and interest becomes a prior lien. Act of April 25, 1927.

Missouri provides that the distributor is given a choice of paying a tax on the gross number of gallons of fuel received as shown by invoices, or manuafctured, for sale or use and on which a tax has not been previously paid, instead of on the number of gallons sold, and be relieved of keeping accounts. Act of April 5, 1927.

Montana provides for penalty of 10 per cent and interest of 1 per cent per month for delinquency in payment of tax. Tax also becomes a prior lien. Act of February 15, 1927.

Nebraska's Penalty

Nebraska amended its act providing that a penalty of $25 shall be assessed against a dealer for failure to make a return. Act of April 6, 1927.

New Hampshire has the power to require from common carriers within the state reports as to the shipment of fuels into the state. The tax is collected by the Motor Vehicle Commissioner. Any tax paid on fuels for purposes other than propulsion of motor vehicles on highways will be refunded by the state if application for such refund is made within six months after purchase. Act of May, 1923.

New Jersey in its new law becoming effective April 1, 1927, fixing the tax at 2 cents per gallon, provides that every distributor shall keep a record of all fuels sold or used which shall include the name of the purchaser, the number of gallons used or sold and the date of the sale or use. Every such distributor shall also deliver with every consignment of such fuel his written statement containing the date and number of gallons delivered and the names of the purchaser and the seller. Such record shall be preserved by the distributor for a period of one year and shall be offered for inspection upon the verbal or written demand of the Commissioner of Motor Vehicles, or any of his inspectors. Act of April 1, 1927.

North Carolina requires a bond not exceeding $10,000 before an unassignable license is issued to a distributor by the Commissioner of Revenue. It refunds the tax collected on gasoline not used for the propulsion of motor vehicles, provided the quantity bought at any one time is 10 gallons or more, and also that the application is made for such refund within 90 days from the date of sale. Act of March 4, 1927.

Oklahoma levies on gasoline consumed in the state. The consignee of gasoline received by him for sale or consumption pays the tax, all such gasoline being reported to the state auditor by oil inspectors and their deputies, as well as by the consignee. The tax on all gasoline consumed by manufacturers or producers and not so inspected is to be paid also by such manufacturers or producers. Act of February 21, 1927.

Pennsylvania's Law

Pennsylvania has enacted a law making it unlawful for any person placing in tanks marked with certain trade-marks any other kind of fuel. This is done for the purpose of preventing the bootlegging of gasoline. Many inferior brands have been placed in tanks, and also the tax on same has been avoided by this method. This state also imposes the tax upon individuals, copartnerships and corporations importing gasoline for their own use. Failure to pay promptly is also penalized by imposing attorney's fees for collecting. Acts of March 29, 1927 and April 14, 1927.

South Carolina has had a 5-cent gasoline tax since 1925 and has made no change in rate since that time. Gas tax paid on fuel used in the operation of a yacht or pleasure vessel owned by a nonresident is refunded by this state upon the compliance with the proper procedure, sending proper receipt of such payment together with affidavit reciting that the applicant is the original purchaser of the gasoline. This state also allows a refund of the tax on gasoline sold to government agencies when such posts have been lawfully ceded to the Government for Army, Navy or Marine purposes. Act of March 30, 1925.

South Dakota allows 4 per cent of the total gallonage received every calendar month to be deducted by the dealer to cover his losses in handling such motor vehicle fuels, and a refund to be made to the dealer for the tax paid on all fuel which after such payment shall be lost or destroyed by fire, lightning, flood, tornado, windstorm or explosion. Act of March 11, 1927.

Division of Taxation

Tennessee created a division of the Department of Finance and Taxation known as the Division of Motors and Motor Fuels, and fixed the duties of the Commissioner of Finance and Taxation and of the superintendent with respect to the sale price of gasoline. This act levies and collects an additional tax of $5 for wholesalers and $1 for retailers. This act has been declared unconstitutional but there is evidence that the state will appeal the decision to the United States Supreme Court. Act of 1927.

Utah in an amendment to its act provides that municipalities, counties, and other branches of State Government are not exempt from the state tax. Act of March 14, 1927.

West Virginia provides that every distributor shall pay an annual license tax of $5 for each station within the state for gasoline sold for resale, and an annual license tax of $1 for each filling station for gasoline sold at retail. Every other dealer shall pay an annual license tax of $1 for each filling station at which gasoline is sold. A tax shall be paid by the person first selling, purchasing or using the gas. Report from distributors is required monthly; report from dealers semiannually. Act of July 1, 1927.

Wisconsin provides for refunds of tax where gas is sold in municipalities bordering on an adjoining state in which

no gas tax is imposed, or which has a lower rate than Wisconsin, and where sales must be made in competition with sellers of gas in such other state. When the gas tax is not paid on time, interest accrues from the last date that tax was paid at the rate of 10 per cent per annum. Persons failing or refusing to make returns are subject to heavy fine. Gas purchased or used for purposes other than for motor vehicles are subject to refund. Dealers report monthly the number of gallons sold and purchased, the name of the company, and the initials and the gallonage of each car to the state treasurer. Act of 1927.

Trend Upward

As the trend of all the states in the imposition of the gasoline tax, it seems proper that this conference should carefully consider the maximum of this tax. A gasoline or liquid fuel tax is a fair means of securing revenue for the construction of highways and bridges. The ideal tax system is one where the taxpayer receives the benefit of his tax payments. The United States is now expending $100,000,000 annually for road improvements. This great expenditure has been brought about by the use of the automobile. We now have in use in this country 20 000 000 automobiles, trucks and buses. In 1895 we had just four registered cars. There is no reason why this new method of transportation should not assume the burden of the repair, maintenance, upkeep and construction of our highways.

Some advocates of the gasoline or liquid fuel tax contend that the rate of taxation must depend upon the amount of revenue required. This is not entirely sound. The tax is an excise tax. It is already one of the heaviest tax burdens ever imposed upon a commodity. Considering the average selling price of gasoline and the average tax, it is now approximately 20 per cent. Except in a great emergency, this is an extremely heavy burden. The science of levying and collecting tax is based upon certain well-known principles. If the tax is too heavy we decrease the amount of revenue received from the same as we discourage the people who are either using the commodity or manufacturing it. The tax collected is a toll for the use of the road. For example, if the average mileage received from gasoline is 12 miles per gallon, it means that we are paying one-fourth a cent per mile toll. This is an average of 25 cents per 100 miles. If all the roads are good this seems to be a reasonable toll. Many of the roads used, however, are in bad condition, and in some cases almost impassable. The total road mileage in the country is 3,001.825 miles, and 521,915 miles, or one-sixth, are improved. This, of course, greatly increases the toll on the improved roads.

The laws enacted during the last year for the most part have been for the purpose of clarifying the administration of the laws, and the distribution of the funds. No radical legislation has appeared at any place.

Burden a Problem

While the burden of taxation may be spread over a long period by the issue of bonds and passing a part of the obligation to future generations, yet it does mean heavy taxes and is a problem which must have the earnest consideration of our economists. The tendency to increase taxation of all kinds has grown in every part of the country. In fact, the only place where expenditures have been decreased is by the Federal Government. We cannot complain of heavy taxes as long as we approve vast expenditures. We must not criticise the Federal Government for heavy taxes unless we start to lower local expenses.

This vast expense in road improvement and the tremendous cost of the upkeep thereof must be met in some manner. The theory that the individual or individuals receiving the benefit should pay the bills, has caused our lawmakers to levy a tax on gasoline or liquid fuels for road construction. There has been little opposition to this tax as the improvements in our roads have been so marked that the taxpayer believes that he is getting full value for his money.

Good roads have almost revolutionized our plan of living. Millions of our people are visiting various parts of our country in a most inexpensive and pleasant manner. This acquaints them with the trials and difficulties of the different sections of the country. Usually each locality considers that it is imposed upon from a tax standpoint and has the greatest difficulties to encounter as far the governmental matters are concerned. Traveling disabuses this to a great extent. Therefore, gasoline or liquid fuels taxes used for the improvement of our highways will aid in obliterating sectional feeling, one of the most serious problems confronting the men of America in the founding of our Nation and the gradual expanse of the same.

GAS LIFT PUMPING IN CALIFORNIA FIELD

(Continued from Page 91)

mechanism tends to shut down the flow, and vice versa.

To Maintain Constant Flow

The Natural Gas Equipment Co.'s differential regulators are also used in connection with wells flowing by the gas lift. This equipment, like the Foxboro, is used to maintain a constant flow of gas to the well. When a well heads and the pressure in the well goes up due to oil accumulating in the well above the inlet of the tubing, the device automatically increases the volume of gas to the well and reduces the heading cycles. Under opposite conditions, as when too much gas is being delivered to the well and the pressure is reduced, the volume of gas flowing through the line is automatically decreased. The rate of flow of gas to the well is accomplished by maintaining a predetermined difference in pressure between the upstream and the downstream sides of an orifice installed in the gas line. The differential regulator is installed in the same line, either above or below the orifice plate. The high-pressure side of the diaphragm which actuates the valve in the regulator, acts against the lesser gas pressure on the downstream side of the orifice and against the tension of a spiral spring. This spring may be set for the desired difference in pressure of the gas. Changes in gas flow may be made by changing either the size of the orifice, or the adjustment of the spring tension. Any type of differential pressure recorder may be installed with this gas flow regulator when it is desired to record the differential pressure on a chart in order to compute the volume of gas flowing through the line to the well.

Gas Preheaters

Preheating the compressed gas by steam before it enters a gas lift well, in an ordinary type of heat interchanger has made it possible to flow some of the low-gravity California oils. In Cat Canyon, Santa Barbara County, 11.5 A.P.I. gravity oil, so viscous that it will not flow at ordinary temperatures, is being flowed successfully from a depth of about 2,900 feet by the use of heated gas. The compressed gas at 475 pounds per square inch pressure is heated by steam to about 200 degrees Fahrenheit in a preheater made out of a piece of 10-inch casing 4 feet long. The gas passes through 38 tubes, 3 feet long, which are welded in headers and enclosed in the preheater, and is delivered to the well where the temperature at the casinghead is maintained at 190 degrees Fahrenheit. The oil from the well has a temperature of 100 degrees Fahrenheit at the casinghead.

Surprisingly small volumes of heated gas are required to flow this oil, the viscosity of which has been appreciably lowered by the heated gas. Two wells, producing respectively 275 and 350 bbls. of oil daily are being flowed by 330,000 cubic feet of heated gas a day at 500 pounds per square inch pressure. This volume of gas is being furnished by one compressor.

Some low-gravity oils in California have also been successfully flowed by preheated air. One well in particular, when flowing through 3-inch casing from a depth of 2,000 feet, flowed 250 bbls. of 16 A.P.I. gravity oil a day with 340,-

PATRICK CARBON
for Diamond Core Drilling

"Specify Patrick Carbon"

PATRICK CARBON is backed by a reputation for quality, skilled grading and honest values developed over a period of many years. Underlying it all is the spirit of Square Deal carbon buyers respect and appreciate.

SEND FOR BOOKLET

You can get in touch with our representative by wiring Duluth office

R. S. PATRICK
Duluth, Minnesota, U.S.A.
Cable Address, "Exploring" Duluth

"A REAL OIL COUNTRY BELT"

O AND G

OIL GAS

Pumping—Drilling — Compressor
Double-Stitched

BELTS

RUGGED DURABLE

Not just A belt but a REAL POWER TRANSMITTER

ECONOMICAL

Manufactured by

IMPERIAL BELTING CO., Chicago

Sold by

OIL WELL SUPPLY CO.

In All Fields

STANDARD
O
I
L
ISSUES

PIPE LINE
COMPANIES

We shall be pleased to furnish information regarding these companies.

CARL H. PFORZHEIMER & CO.

(Specialists in Standard Oil and Miscellaneous Oil Securities)

25 Broad Street New York, N. Y.

OTHER "PENBERTHY" PRODUCTS

Ejectors
Cellar Drainers
Oil Gages
Water Gages
Oil Cups
Grease Cups, Etc.

PENBERTHY PRODUCTS

Special High Pressure Automatic Injector

Write For Catalog

Owing to the increasing demand in the oil fields for injectors to operate on higher pressures, this high pressure injector is recommended where boilers are operated at pressures to 200 pounds.

PENBERTHY INJECTOR COMPANY
Established 1886
Canadian Plant: WINDSOR, ONT., CAN.
1260 Holden Ave., DETROIT, MICH.

000 cubic feet of air at a temperature of 190 degrees Fahrenheit. When the temperature of the air was raised to 300 degrees Fahrenheit and the tubing diameter increased to 4 inches, production rose to 325 bbls. at an added consumption of only 60,000 cubic feet of air per day. The normal working air pressure in both cases was 240 pounds.

Many gas preheaters are "homemade" affairs. Those that have come to the writer's attention in addition to the one described above, were made of used 11⅝-inch casing about 20 feet long. A coil of 2-inch pipe, bent so that the gas or air passing through it made three complete passes from end to end of the casing shell was inserted inside the casing. The ends of the coil passed through metal heads welded at the ends of the casing. The air or gas, therefore, traveled a distance of nearly 60 feet inside the heater. The steam which surrounds the 2-inch coil enters the casing near one end through a 1-inch nipple and exhausts through a similar size nipple at the opposite end.

Few California wells give trouble because of the paraffin content of the oils. Where paraffin has deposited in the eduction tubes in a few wells operated on the gas lift and has reduced production by decreasing the effective inside diameter of the tubing, preheating the gas has been beneficial in preventing the deposition of paraffin. Heating the gas slightly by injecting live steam directly into the gas line to the well for short periods at weekly intervals is another method that has successfully eliminated paraffin trouble at some wells, especially those in the Santa Fe Springs oil field.

Gas Traps

In order to separate the gas from the oil and to recover the gas, it is necessary to flow the mixture of oil and gas from the well into gas traps or separators. Vertical cylindrical traps capable of withstanding pressures ranging from partial vacuum to 50 or more pounds per square inch and actuated by internal floats or external mechanical contrivances are used for this purpose in California. The majority of gas traps are located at an elevation above the derrick floor so that the oil will flow by gravity to the gauge tanks and thus reduce the back pressure on the well to a minimum. Sometimes the traps are located in the derrick 20 to 30 feet above the derrick floor on a platform made by placing timbers across the derrick girts. More often they are situated on a separate platform immediately outside the derrick.

The height to which gas traps should be elevated depends upon the location of the gauge tanks and upon the well fittings and flow line from the tubing head. For efficient operation, the oil line from the top of the tubing to the gas trap should be free from right-angle bends and no part of the line should be horizontal. Abrupt changes in the direction of the flow of the oil and gas mixture from the well introduce friction and create back pressures on the well. Horizontal lines allow the gas to separate from the oil and flow along the upper part of the line. Bypassing of the gas in the head line from the tubing head to the gas trap decreases the over-all efficiency of the gas lift. For best results the flow line from the top of the tubing to the gas trap should be goosenecked. In one instance, the daily production of a 350-bbl. well was increased to 366 bbls. by removing one 90-degree ell from the flow line between the tubing head and the gas trap and installing a gooseneck flow line in place of the horizontal line with its vertical riser.

Pressure and Volume-Recording Devices

It is important that automatic recording gas meters and pressure gauges be provided on the gas lines to the wells and on the gas discharge lines from the gas traps. The successful operation of the gas lift method of flowing wells depends in a large measure upon the volume and pressure of the gas delivered to the well. The data obtained from pressure and volume-recording devices are invaluable to engineers and others upon whose knowledge and skill depends the successful operation of the gas lift. Continuous records of both static and differential pressures of the gas to and from the wells, recorded on 24-hour charts, is the means of gauging the performance of the gas lift. Without these records, operators work more or less in the dark, and inefficient operation usually results. The difference between the gas volume passing through the meter on the gas-discharge line and that passing to the well is the volume of gas coming from the oil sand and from solution in the oil. If there is no leakage of gas to low-pressure sands above the productive horizon in the well then the ratio of this differential gas figure in cubic feet per day to the volume of oil in barrels produced daily is the formational gas factor, better known as the gas oil ratio.

Various types and makes of volume and pressure-recording devices are in use in the California fields. Each type is an orifice meter with a recording gauge.

Where the central header control method of flowing wells by gas lift is used, the pressure and volume-recording instruments on the gas intake lines to the wells are usually located in the header house. This arrangement makes it possible to operate the wells efficiently from this central location. At one installation in southern California, one man per tour is taking care of over 20 wells, some of which are located a mile away from the header house. The outlet gas meters are always located at the gas traps where they measure the wet gas as it leaves the traps.

Casinghead Connections

Various types of packed casingheads are used in the casinghead or "Christmas tree" assembly on gas lift wells in California. The most important requirements of the casinghead gas lift well are that it be secured against leakage of gas and strong enough to support the string of tubing suspended in the well. Pressures of 900 to 1,000 and more pounds per square inch are required to start certain wells flowing, so that it is essential that casingheads be designed and packed to withstand such pressures. The weight that may come on casingheads varies with the size and length of the tubing and whether or not the tubing is suspended off bottom. Strings of 2½ and 3-inch tubing, 4,000 to 5,000 feet long, are common in the California oil fields.

The gas connections are usually so arranged that the gas may be introduced through the tubing or between the tubing and the casing. This arrangement allows the well to be "rocked" as described under the heading "Starting Pressures," until the fluid column in the eduction tube becomes sufficiently aerated to start the well flowing with normal working pressure. For convenience of starting the valves in the gas line to the casing and in the bypass line to the tubing are located close together on the derrick floor at the casinghead.

All gas lift wells in California, however, are not fitted for "rocking." Some operators rely entirely upon high gas pressure to start the flow of oil from the wells. This method of starting wells is successful where high-pressure gas from high-pressure or booster compressors is available and in wells where high starting pressures have no detrimental effect on the well. However, since the productive sands in many wells take gas at pressures less than that required to start the well flowing by introducing high-pressure gas, the only alternative starting methods used at such wells is "rocking" (reversing the gas flow), lightening the column of fluid in the tubing by swabbing, and raising the tubing. To subject wells to pressures higher than the rock pressure even for a short time is dangerous practice. Sediment in the oil often clogs the walls of the well or the walls become plastered with mud. Such wells must usually be cleaned to restore the drainage area to its original condition.

Cost of Installing Gas Lift Process

The cost of installing the process will depend largely upon the equipment already in use on the property. Usually gas traps, gauge tanks and gas lines to dispose of the gas from the traps to gasoline plants are already installed at a well to take care of the production while

it is flowing. Such equipment can usually be used for the gas lift process without many material changes. As the gas lift method of flowing a well is simply another method of pumping a well and is seldom used until after a well has stopped flowing naturally or shortly before, it is but a question of which method of pumping will give the largest return on the capital invested. Wells on the gas lift usually produce more oil than would have been obtained in the same length of time by ordinary pumping methods and often the increase in gasoline recovered from the gas will pay all installation costs in two to six months.

Gas lift pumping stimulates production during the early life of a well. More oil is usually produced than could be raised by the ordinary oil field plunger pump. Where at some wells from 300 to 600 bbls. of oil was the maximum obtainable by ordinary pumping methods, the gas lift has produced from 600 to 1,000 bbls. a day for a long period.

For equipping wells to produce by the gas-lift method, there are necessary in addition to gas traps and gauge tanks and other equipment of flowing wells:

1. A compressor plant, including gas engines or electric motors, compressors and accessories. If compressors are steam-driven steam boilers of sufficient capacity are required.

2. Pipe lines for distributing the compressed gas to the wells.

The costs of central compressor plants vary with the types and amount of equipment installed and with the character of the installation and construction. From a limited amount of data the costs of completed compressor plants of several types of equipment have been obtained. The costs of several complete plants erected recently in California vary from $15 to $25 per 1,000 cubic feet per day capacity. These costs include all compressor equipment, absorbers, piping, gauges, buildings, etc.

Sizes of Compressors

Various sizes of compressors are used for flowing single wells. At some wells in California 8 by 4 by 8-inch straightline, tandem, two-stage compressors having a piston displacement of 113 cubic feet and rated at 500 pounds per square inch working pressure are used. At other wells, 12 by 6 by 12-inch duplex, two-stage compressors with a piston displacement of 312 cubic feet are used, while compressors intermediate in size between the 8 by 4 by 8 and 12 by 6 by 12-inch are common in the California oil fields.

The cost of an electric motor-driven compressor plant, including an 8 by 4 by 8-inch straightline, tandem, two-stage compressor, complete with electric motor, belt, foundations, piping and labor charges is about $3,500; when a 10 by 4½ by 10-inch compressor is installed the complete cost of the plant is about $4,500; and a 12 by 5 by 12-inch compressor installation with electric motor and accessories, including the cost of installing, is from $5,600 to $6,500.

Where gas engines are used to drive the compressors, costs of complete plants have been considerably more than plants of similar capacity operated by electric motors. On one property the cost of a one-unit compressor plant consisting of a 10 by 4½ by 10-inch duplex, two-stage compressor, driven by a 60 horsepower gas engine was $8,050. This cost includes concrete foundations for the compressor and gas engine, belt, meters, gauges, piping, and all labor costs.

A steam-driven 10½ by 5½ by 12-inch compressor with 8-inch steam cylinders, a 75-horsepower fire box boiler, concrete foundation for the compressor, necessary accessories, and labor charges cost on one property $6,600.

Housing costs are not included in any of the above figures for one-unit compressor installations because they vary with the size of the building and the materials used in its construction. Also in many cases no building is constructed over the compressor plant.

Portable gasoline engine-driven units complete with 8 by 3½ by 8-inch straightline tandem, two-stage compressor, 155 cubic feet displacement capacity, rated at 500 pounds working pressure, belt connected to a gasoline engine with 5⅜-inch bore and 6¼-inch stroke, mounted as a unit on a 4-wheel steel-tired truck, costs $4,200 delivered in the Southern California oil fields.

Portable electric motor-driven compressor units with a capacity of 250 cubic feet displacement, mounted on 4-wheel trailers cost complete, ready to operate, from $5,000 to $6,500, depending upon the size of the machinery and the kind and make of trailer. The higher figure is for an Ingersoll-Rand type X. R. B. duplex, two-stage compressor with high and low pressure cylinder 12 by 12 and 6 by 12-inch, respectively. The compressor is driven at 225 r.p.m. by a 100-horsepower electric motor. The compressor and motor, together with starting controller, resistance girds, and all necessary gauges are mounted complete as a unit on a 4-wheel solid rubber-tired trailer. This outfit will easily handle one 4,000-foot well making 1,000 or more barrels of oil daily. When intake gas at pressures of 75 to 100 pounds per square inch is obtainable, this same outfit will handle two wells by using two 6 by 12-inch cylinders and operating the compressor as a single stage unit.

Operating Costs

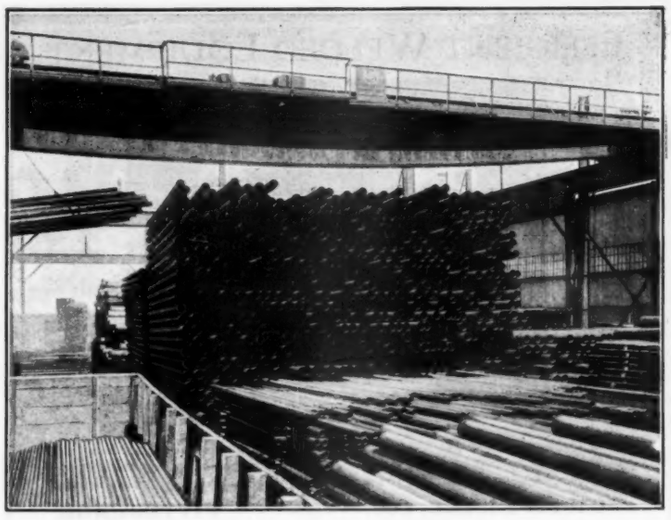
It is difficult to determine the actual cost of pumping oil wells by the gas-lift method when compressed gas is supplied by a central compressor plant. Operators usually charge to pumping costs only the cost of compressing the gas supplied to the well, giving the well neither credit for the added gas returned, nor the additional amount of gasoline recovered. The generally accepted figure for the cost of compressing natural gas in large central compressor plants in California is from 3 to 5 cents per 1,000 cubic feet. Plants with an output of 6,000,000 or more cubic feet of gas per day estimate the cost of compressing gas at 3 cents per 1,000 cubic feet. In smaller central plants, the proportionally greater overhead and labor charges usually tend to increase the compression cost to 5 to 7 or 8 cents per 1,000 cubic feet of gas compressed.

The cost of lifting a barrel of oil varies with the volume of extraneous gas required to raise a barrel of oil to surface. On the basis of 3 cents per 1,000 cubic feet as the cost of compressing natural gas, some operator's lifting costs are not a great deal above 3 or 4 cents per barrel. The average lifting cost by the gas-lift method of a large number of wells using gas from a central compressor plant is about 8 cents per barrel of oil.

One operator in the Southern California fields who operates 12 or more wells from a 5,000,000 cubic foot daily capacity central compressor plant estimates that his company is flowing oil by the gas-lift method at from 5 to 7 cents per barrel. In figuring this cost, he estimates the depreciation of the compressor plant at 20 per cent per year. In other words, the cost of the plant is charged off entirely within 5 years.

The cost of operating one-unit compressor plants having a capacity of 400,000 or less cubic feet of gas per day, varies from $25 to $40 per day, depending mainly upon the kind of motive power used. The lower figure for a steam compressor, with the cost of operating an electrically-driven compressor about midway between these two extremes. Using the above figures as a basis, the cost of compressing 1,000 cubic feet of gas in a one-unit compressor plant varies from about 6 to 10 cents. The cost of lifting a barrel of oil when one-unit compressor plants are used varies therefore from 6 to 20 or more cents with the average around 12 cents per barrel.

The lifting cost of 10 to 12 degrees A.P.I. gravity oil at Cat Canyon, California, by the gas-lift method is about 14 cents per barrel, whereas it previously averaged nearer 45 cents per barrel when the wells were on the pump. Not only has the lifting cost been reduced, but the production has been materially increased since the wells were placed on the gas lift. The gravity of the oil has also been increased about 2 degrees A. P.I. gravity, principally because the gas-lift has been instrumental in decreasing the sand cut from about 30 to 3 per cent.



SOLD! Loaded and Shipped in 36 Hours After Receipt of Order

That's an example of Greenspon service—these 14 miles of ODEE pipe went out in record time. Do you know ODEE Pipe?

Absolutely new, high-quality grade—in single lengths or "bull-dog" welded into double lengths. ODEE pipe is ready to save you 50% of your field welding. We have ODEE double-joint pipe in all sizes for gas lines, at startlingly low prices. Immediate shipment can be made. Write, wire or 'phone for quotations. With a suitable down payment, your line can be financed out of income.

ODEE PIPE FOR GAS LINES

Jos. GREENSPON'S Sons
Iron & Steel Company
General Office: St. Louis. *Branch Office:* Tulsa, Okla.

Hairline Precision

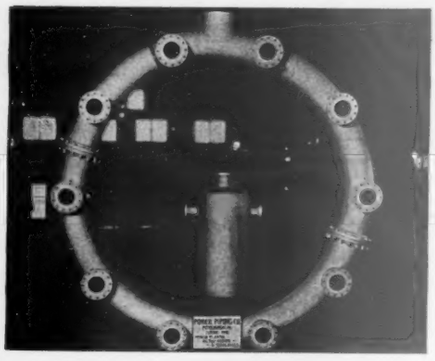
Precision at all times in its manufacture—careful selection of material—and years of experience,—that tells the story of

DIAMOND
—H—
Bit and Jar Steel

Diamond "H" Bit and Jar Steel —a product of unvarying uniformity that has always been made on a quality basis only.

HEPPENSTALL FORGE & KNIFE CO.
PITTSBURGH, PENNA.
Fort Worth — Texas Office
1415 F. & M. Bank Building

EFFICIENT WELDED EQUIPMENT



Circular header with welded outlets.

Receiver separator shown in background.

The unique advantages of welded piping equipment for certain requirements are now fully recognized by engineers everywhere, We can offer original and appropriate suggestions tending toward more efficient, less costly installations.

POWER PIPING CO. • PITTSBURGH

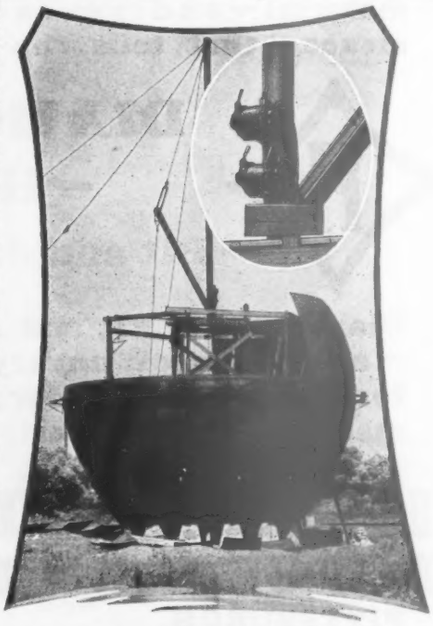
Erecting "Horton-Spheres" With Turbinair Hoists

Here's the little 345-lb. Sullivan Turbinair hoist doing another big erection job for the Chicago Bridge and Iron Company. Some of the curved steel plates of which the "Horton-Sphere" is made are 8x18 ft. in size and weigh 2835 lbs., but the Turbinair hoist handles them easily.

Two Turbinair hoists are mounted side by side on a stiff leg derrick, one handling the load and the other the boom. Both hoists can be operated at the same time which speeds up the work greatly.

The Graver Corporation, Warren City Tank and Boiler Co., Western Gas Construction Co., and many other organizations are speeding up erection jobs with Turbinair hoists. Are YOU familiar with the lightness, compactness, great power, and speed of these little machines?

Write for Pictorial Booklet, "Handy Hoisting and Hauling."



Sullivan Machinery Company
88 East Adams Street, Chicago

NEW LOCATIONS IN TEXAS PANHANDLE AND NORTH AND WEST TEXAS FIELDS

TEXAS PANHANDLE

Bailey County

Gibson Oil Corp. and others' No. 1 Webb Miller, 200 feet south and west of NE cor., Section 15, League 186, Swisher County School Land.

Carson County

Empire Gas & Fuel Co.'s No. 6 S. B. Burnett estate, C NE, Section 62, Block 5, I. & G. N. Survey.

Hale County

Bailey & Young's No. 1 Thomas (E. Wells), 2,640 feet south and 600 feet west of NW cor., Section 18, Block J-D, E. L. R. R. and located in Section 1, Block J. K. L.

Gouldy & Stone's No. 1 Kitteral, 300 feet north and west of SE cor. NW, Section 65, Black A-3, G. C. & S. F. Survey.

Lamb County

Dan Freel and others' No. 1 Ellwood, at the middle point of the west line of Section 9, Block T, T. A. Thompson Survey.

Wheeler County

Byrens and others' No. 1 W. J. Johnston, 330 feet north and east of SW cor. NE. Section 88, Block A-5, H. & G. N. Survey.

NORTH CENTRAL AND WEST TEXAS

First Reports

Archer County

C. B. Long and others' No. 2 J. J. Perkins and others, 150 feet north and east of SW cor. of the W half of SE, Section 22, Denton County School Lands, League 3, A-117. Barkley-Meadows & Carter's No. 1 W. L. Andrews, 150 feet south and 450 feet east of the NW cor. of Lot 3. Chambers-Dobbs Subdivision, G. C. Frarley Survey, A-129. C. W. Clark and others' No. 1 A. C. O'Donnell, 927 feet north and 1,352 feet west of SE cor., Section 14, Crawford Subdivision. W. J. Grisham's No. 1 W. R. Farmer, 150 feet south and east of the NW cor. of the east 80 acres of the west 160 acres of Section 1, North Anderson Ranch Subdivision. H. Hines and The Texas Company's No. 1 W. R. Farmer, 150 feet south and west of the NE cor., Section 17, North Anderson Ranch Subdivision. Same company's No. 1 L. C. Garvey, 150 feet south and 1,950 feet west of NE cor., Section 66, Club Ranch Subdivision. Maer & Staniforth's No. 1 Virgil Seay, 1,800 feet north and 450 feet west of the SE cor., Section 56, Club Ranch Subdivision. Panhandle Refining Co.'s No. 1 E. Colgin, 2,439 feet south and 150 feet west of the NE cor. of the J. F. Martin Survey, A-276. Same company's No. 1 S. G. Helm, 1,465 feet north and 928 feet west of the SE cor., Section 2, Club Ranch Subdivision, S. P. R. R. Survey No. 1, A-442.

Brewster County

Reese & White's No. 1 Kimball, 1,320 feet north and west of the SE cor., Section 204, Block 9, G. H. & S. A.

Brown County

Amerada Petroleum Corp.'s No. 1 Jim Gilbreath, 280 feet south and 150 feet east of NW cor. of the R. F. De Bord Survey, A-2,136, being 150 feet north and east of the SW cor. of their lease. A. A. Cameron and others' No. 1 A. N. King, 150 feet south and east of NW cor. of the E half of the W. W. Williams Survey, A-2,101. Cranfill & Reynolds' No. 12 M. L. Smith, 709 feet south and 450 feet east of NW cor. of the M. L. Smith 87.25-acre tract out of Section 3, S. A. & M. G. Survey, A-850. Same company's No. 13 M. L. Smith, 709 feet south and 733 feet east of NW cor. of the M. L. Smith 87.25-acre tract out of Section 3, S. A. & M. G. Survey, A-850. Same company's No. 14 M. L. Smith, 709 feet south and 1,016 feet east of the NW cor. of the M. L. Smith 87.25-acre tract out of Section 3, S. A. & M. G. Survey, A-850. Same company's No. 15 M. L. Smith, 709 feet south and 150 feet west of the NE cor. of the M. L. Smith 87.25-acre tract out of Section 3, S. A. & M. G. Survey, A-850. J. K. Hughes Developing Co.'s No. 2 Jim Gilbreath-A, 150 feet north and 450 feet west of SE cor. of the J. Gilbreath 17-acre tract out of Section 1, S. A. & M. G. Survey, A-849. Humble Oil & Refining Co.'s No. 11 A. W. Armstrong, 150 feet south and 762 feet east of NW cor. of Section 1, Juan Delgado Survey 785. Same company's No. 3 Jim Gilbreath, 150 feet south and 161 feet east of the NW cor. of their 30-acre lease out of the R. F. De Bord Survey, A-2,136. Same company's No. 22 Roy Hickman, 150 feet north and east of the SW cor. of their 160-acre lease out of the Thomas Benson Survey No. 783. H. F. Peck and others' No. 1 G. W. Mills, 1,250 feet north and 162 feet east of the SW cor. of Section 80, H. T. & B., A-1,457. Phillips Petroleum Co.'s No. 5 C. Newsome, 150 feet south and 495 feet east of the NW cor. of the G. R. Davis Survey, A-2,106. Rex-Tex & Py-Tex Oil Co.'s No. 1 C. E. Scott, 200 feet south and 150 feet east of the NW cor. of the south 65 acres of the east half of the H. Preslar Survey, A-2,040. Ross Drilling Co.'s No. 1 J. E. Spencer, 150 feet north and east of the SW cor. of the east 5 acres of the west 10 acres of the south 20 acres of the west half of the J. T. Swindell Survey, A-1,171. Sinclair Oil & Gas Co.'s No. 7 M. L. Smith, 150 feet south and 161 feet west of NE cor. of their 20-acre lease out of Section 1, S. A. & M. G. Survey, A-849. E. L. Smith Oil Co.'s No. 9 M. L. Smith, 450 feet north and 774 feet west of the SE cor. of their 60-acre lease out of Section 1, S. A. & M. G. Survey, A-849. E. L. Smith Oil Co.'s No. 19 M. L. Smith, 1,050 feet north and 150 feet west of the SE cor. of their 60-acre lease out of Section 1, S. A. & M. G. Survey, A-849. H. I. Stock & J. W. Love's No. 1 Graham Estate, 1,470 feet south and 1,170 feet west of NE cor. of Lot No. 3, J. Brown Survey No. 137.

Coleman County

Ross Drilling Co. and others No. 1 John Breneke, 150 feet north and west of SE cor. of the John Breneke 120-acre tract out of the Samuel Sprague Survey No. 664. Tower & McKanna's No. 1 C. Q. Hassard, 2,800 feet north and 1,449 feet east of the SW cor. of Lot No. 7, Coleman County School Lands No. 57, being 150 feet south and west of the NE cor. of their 108-acre lease. Bebout & Sullivan's No. 1 W. W. Hunter, 150 feet north and west of the SE cor. of the W. W. Hunter 199.5-acre tract out of Section 99, E. T. R. R. Peer Oil Corp.'s No. 1 Sealy & Smith, 210 feet south and 640 feet east of NW cor. of Section 5, Block 1, G. H. & H. Survey.

Crockett County

Newman Oil Co.'s No. 1 B. C. Clark has been changed to 1,650 feet south and 2,310 feet east of NW cor., Section 1, Block 8, G. C. & S. F. Survey. Taylor-Link Oil and Kirby Petroleum Co.'s No. 2 Powell is 150 feet from south and west lines of their 14-acre tract out of Section 52, Block BB, E. L. R. R. Survey. World Oil Co.'s No. 2 Powell is 2,376 feet from north and 825 feet from east lines of Section 53, Block BB, E. L. R. R. Survey.

Comanche County

J. F. Carter and others' No. 1 J. M. Strickland, 150 feet south and 450 feet west of the NE cor. of the north 100 acres of the south 132 acres of the J. M. Strickland tract out of the J. P. Stevenson Survey No. 3. Hoffer Oil Corp.'s No. 1 B. W. Crump, 330 feet south and east of the NW cor. of the B. W. Crump Survey No. 339.

Crane County

In Crane County, Prairie Oil & Gas Co.'s No. 7 State-Lasseter is 330 feet south and 1,650 feet west of NE cor., Section 47, Block 30. Pecos Oil Co.'s No. 13 University is 1,650 feet north and 990 feet east of SW cor., Section 47, Block 30. Magnolia Petroleum Co.'s No. 13 University-Hardwicke is 330 feet north and 1,650 feet west of SE cor., Section 38, Block 30.

Prairie Oil & Gas Co.'s No. 5 State-

ELLIOTT-ALCO CORES
Cost Less Per Foot of Perfect Cores Recovered
Adequate core recovery at deep and critical depths, and in all formations, at a minimum cost per foot of perfect cores recovered is an accredited and consistent achievement of the Elliott-Alco Core Drill.
The scientifically hardened cutter head, together with the two-piece construction providing quick renewability are important factors making for long life, and the reduction of money invested in coring equipment.
Descriptive literature on request.
ELLIOTT CORE DRILLING CO.
850 Subway Terminal Building
LOS ANGELES, CALIFORNIA
Branches:
3210 Harrisburg Blvd., Houston, Texas
123 East 3rd Street, Tulsa, Okla.
618 Lake Street, Shreveport, La.
432 Park Street, Beaumont, Texas
Export Office:
150 Broadway, New York

"Better Play Safe and Use Hoyt's"

Bronze-backed, babbitt-lined bearings are in wide general use, yet seldom do shop foremen and superintendents realize that there is a particular kind of babbitt for the requirements of the bearing.

Hoyt's line is complete. There is a babbitt for every bearing need, one that has been blended with that requirement in mind. Genuine "A", for instance, is the finest babbitt that money can buy. Yet it costs no more.

HOYT'S GREAT EIGHT

Genuine "A" Babbitt
Eagle "A" Babbitt
Trojan Babbitt
Electric Railway Babbitt
Oil Engine Babbitt
Gas Engine Babbitt
Faultless Babbitt
Standard No. 4 Babbitt

Department F

HOYT METAL CO., St. Louis
NEW YORK CHICAGO DETROIT

Genuine "A" is the finest babbitt you can buy for the bearings of machinery where heavy load is distributed over small bearing surface or where excessive high speed is developed.

HOYT Babbitts

Tighten Two Bolts and the Joint Is Made

VICTAULIC PIPE COUPLINGS are fitted in less time than it takes to get ready to make a caulked, screwed or flanged joint.

Slip the ring over the pipe ends. Place the housing in the pipe end grooves. Tighten two bolts and the joint is made—by unskilled labor in two minutes or less.

No yarning, caulking, handling of hot metal, no pipe threading, or gasket fitting, no painstaking manipulation of long pipe lengths.

VICTAULIC COUPLINGS are flexible—allow a deflection of approximately 5 degrees in any direction. The separation of the pipe ends within the joint provides for line contraction and expansion — making special expansion joints unnecessary.

Supplied for all pipe sizes from ¾" up — for pressures from vacuum to over 2 tons per square inch—for steel, wrought iron and cast iron pipes.

For detailed information and list of uses and users, write for Victaulic Bulletin No. 1.

The all-purpose Coupling

VICTAULIC COMPANY OF AMERICA
26 Broadway, New York, N. Y.
Western Distributors
SMITH SEPARATOR COMPANY
Tulsa, Oklahoma

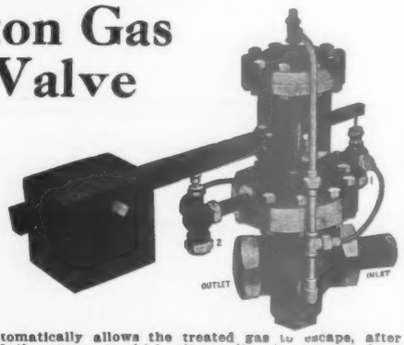
"For every joint on the line"

VICTAULIC
REG. U.S. PAT. OFF.

Flexible and Leak-tight Pipe Couplings
FOR CRUDE OIL, GAS, WATER, COMPRESSED AIR, ETC.

The Fulton Gas Relief Valve

For Natural Gas Gasoline Plants



The Fulton Relief Valve automatically allows the treated gas to escape, after the compression has reached the stage at which all gasoline is removed from the gas under treatment, and permits a fresh supply of untreated gas to enter. The weights on the lever can be accurately adjusted to operate at the desired point of compression. When this point is reached the valve blows until the pressure falls to 20 or 25 pounds, or until the treated gas has escaped.
By regulating the tappet screw on the lever which touches the stem of the exhaust pilot valve, the period of blowing can be shortened or lengthened as may be desired.
WRITE for list of installations in your vicinity. See this Relief Valve in operation. Talk with the operators. Make your own investigations. Send for complete catalog.

The Chaplin-Fulton Mfg. Co.

Organized 1884—Oldest builders of gas regulators in the country. Built in all sizes, from 1 inch to 24 inches; for all service, 1 oz. up to 1,000 lbs. pressure to square inch.

28-40 Penn Avenue **Pittsburgh, Pa.**

47

SKINNER Clamps stop leaks

Send for Catalog

M. B. SKINNER CO., 562 Washington Boulevard, CHICAGO

Lasseter, 990 feet south and 1,650 feet west of NE cor. of Section 47, Block 30, University Lands. Same company's No. 6 State-Lasseter, 1,650 feet south and west of the NE cor. of Section 47, Block 30, University Lands.

Cooke County

Camp-Heydrick & Oil Operators Trust Co.'s No. 1 John Bayer, 950 feet north and 880 feet east of the SW cor. of Section 1, John Barnett Survey, A-42, being 450 feet south and 150 feet west of the NE cor. of their 30-acre lease. P. R. Harris' No. 1 I. B. Lewis, 450 feet south and 200 feet east of the NW cor. of the I. B. Lewis 150-acre tract out of the James Sadler Survey, A-902.

Eastland County

J. M. Gholson and others' No. 1 J. S. Powell, 2,118 feet south and 342 feet east of NW cor. of the J. S. Powell 200-acre tract out of the S. Dooley Survey. Mook-Texas Oil Co.'s No. 3 U. Casey, 850 feet south and 1,220 feet east of the NW cor. of the U. Casey 253-acre tract out of the W. Van Norman Survey. H. H. Adams and others' No. 4 W. H. Grove, 300 feet south and 150 feet east of the NW cor. of the NE of Section 487, S. P. R. R. Survey.

Howard County

In Howard County, Texon and Marland's No. 1 W. R. Settles, Lease A, C SW, Section 134, Block 29, was given last week as No. 3 Settles. E. W. Miley and Marland Oil Co.'s No. 1 C. D. Read is in the C NW, Section 12, Block 31, T. & P. Survey, T-1-N.

Magnolia Petroleum Co.'s No. 8 Mary Chalk, 660 feet south and east of the NW cor. of the NE of Section 124, Block 29, W. & N. W.

Hudspeth County

Lockhart and others' No. 1 Gardner & Mosely, C of NW of Section 12, Block 18, Public School Lands.

Jack County

Madden & Hunt's No. 3 J. R. Sloan, 1,350 feet south and east of NW cor. of Section 1, J. W. Williams Survey, A-877.

Jeff Davis County

J. K. Hughes' No. 2 J. Z. Means, C of SE of Section 431, Block 4, H. & T. C. R. R. Survey.

Montague County

L. Seigler and others' No. 3 J. W. Maddox, 330 feet south and 450 feet east of NW cor. of Lot No. 14, S. H. Arnold Survey, A-5. F. W. Walton and others' No. 1 G. B. Heaton and others, 700 feet north and 450 feet west of the SE cor. of the north 50 acres of the south 390 acres of the G. B. Heaton and others tract out of the O. Buchman Survey, A-73.

Palo Pinto County

P. K. French and others' No. 1 Mary J. Taylor, 150 feet south and west of the most easterly NE cor. of the Mary J. Taylor 156.5-acre tract out of Section 21, Block 1, T. P. R. R. Survey.

Pecos County

In Pecos County, Allsman & Bell's No. 4 Pecos River Bed, is located 325 feet upstream from No. 3 and midway between the river banks. It is between Sections 71 and 61. The California Co.'s No. 3 Smith is 2,537 feet south and 330 feet east of NW cor., Section 35, Block 194, G. C. & S. F. Survey. Humble Oil & Refining Co.'s No. 1 Smith-B is in the SE cor. of Section 101, Block 194. Same company's No. 2 Smith is 2,537 feet south and 330 feet west of NE cor., Section 36, same block; No. 3 Smith is 275 feet south and 2,800 feet west of NE cor., same section. McMan and Marland's No. 7 Yates is 2,343 feet east and 275 feet south of SW cor., Section 103, Block 194, and located in Section 34½; No. 8 Yates is 2,800 feet west and 275 feet north of NE cor., Section 36, Block 194, but located in Section 34½. Simms Oil Co.'s No. 2 Mrs. M. A. Smith is 2,343 feet from west line and 275 feet from south line of Section 103, same block. Corrected location of Red Bank Oil Co.'s No. 2 M. A. Smith is 832 feet south of north line (instead of 660 feet south of line) and 1,980 feet east of west line, Section 24, Block 194.

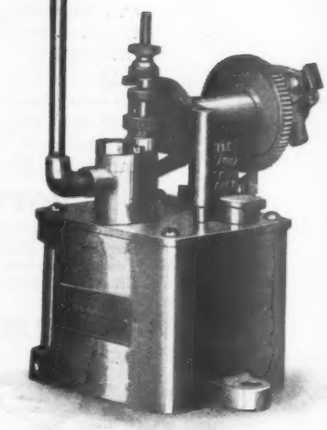
Mid-Kansas Oil & Gas Co.'s No. 9 I. G. Yates-A, 1,353 feet north and 1,320 feet east of the most westerly SW cor. of the I. G. Yates Survey, A-8,195. Same company's No. 7 I. G. Yates-B, 1,373

They hold the flow of oil as desired

Oil is not under atmospheric pressure from the time it is inducted until delivery is accomplished. Air binding never occurs. By maintaining a constant pressure from the suction valve to delivery end, a regular discharge is assured, and once set to feed a given amount of oil, no further regulation is necessary.

Any equipment builder will gladly furnish Hills-McCanna Lubricators installed and ready to operate on new machinery, or they may be purchased from your supply man, or purchased direct from us.

HILLS-McCANNA FORCE FEED Lubricators



HILLS-McCANNA CO.

2349-59 NELSON ST.
North Branch Chicago River at Western Avenue, Chicago.

FIRST *in the field of* FORCE FEED LUBRICATION

Accurate information concerning every activity of the Petroleum Industry is becoming more and more valuable. It is absolutely essential to the man who wishes to make a success in the Oil Business.

Knowing these facts, and realizing the possibilities of quick developments of importance to you, The Oil and Gas Journal takes every means to make sure that you will receive accurate information every week, in detail, with maps, charts, well-logs, technical articles, surveys, tables, designs, pictures, etc.

The members of the Editorial Staff are working for you always. They never stop. They are on the alert constantly, seeking fresh news, verifying reports, compiling facts, investigating rumors, etc., so that you will be among the VERY FIRST to receive the benefits of new developments or expansions.

Keep in close touch with activities. Have The Oil and Gas Journal delivered to your home or office every week and always renew your subscription promptly.

Then you will have complete, authentic, valuable oil news at all times.

The Oil and Gas Journal
Tulsa, Okla.
$6.00 for 1 yr. $3.00 for 6 mo.

feet south and 2,390 feet east of the NW cor. of Section 61, Block 1, I. & G. N. Survey. Same company's No. 8 I. G. Yates-B, 1,373 feet south and 3,460 feet east of the NW cor. of Section 61, Block 1, I. & G. N. Survey. Same company's No. 9 I. G. Yates-B, 811 feet north and 785 feet east of the NW cor. of Section 60, and located in Section 61, Block 1, I. & G. N. Survey.

Shackelford County

Texas Unity Oil Co.'s No. 1 Russ-Webb, 150 feet north and west of SE cor. of NE of Section 22, Block 11, T. P. R. R. Survey.

Stephens County

C. J. Clark's No. 2 S. J. Riddle, 1,150 feet north and 700 feet east of the SW cor. of the S. J. Riddle 115-acre tract out of Section 67, Block 4, T. P. R. R. Survey. Same company's No. 3 S. J. Riddle, 1,500 feet north and 650 feet east of the SW cor. of S. J. Riddle 115-acre tract out of Section 67, Block 4, T. P. R. R. Survey. C. V. Lyman and others' No. 1 J. C. Curry, 305 feet north and 1,000 feet east of the SW cor. of Section 3,392, T. E. & L. Survey. McKinnon and others' No. 1 H. E. Langford, 200 feet north and 990 feet east of the SW cor. of the NE of Section 52, Block 6, T. & P. R. R. Survey.

Tom Green County

J. C. Cox and others' No. 1 Llano County School Lands, 150 feet north and west of the SE cor. of Section 25, Llano County School Lands, No. 964.

Young County

Gulf Production Co.'s No. 5 T. L. Lisle, 717 feet north and 650 feet west of the SE cor. of their lease out of Section 37, Brazos River Indian Reserve, (Marg. Hall Survey, A-1,453). The Texas Company's No. 1 R. Campbell, 1,198 feet north and 993 feet east of the SW cor. of Section 1,452, T. E. & L. Survey. Nash & Windfohr's No. 1 W. B. Hinson, 188 feet north and 200 feet west of the SE cor. of the W. B. Hinson 47.5-acre tract out of the P. Pier Survey, A-219. Pitzer & West's No. 4 J. E. Morrison Co., 650 feet north and 200 feet east of the SW cor. of the B. W. Hammond Survey, A-1,320. Same company's No. 2 J. E. Morrison Co.-B, 200 feet south and 570 feet west of the NE corner of the east 40 acres of the west 60 acres of the J. E. Morrison Co. 122-acre tract out of the E. Sherrill Survey, A-271.

Wichita County

Duncan & White's No. 1 American Refining Co., 150 feet south and 1,201 feet west of the NE cor. of the Section 2, Denton County School Lands, League 4, A-417. Same company's No. 3 R. Nitschke, 650 feet south and 520 feet west of the NE cor. of Section 2, Denton County School Lands, League 4, A-417. W. M. Moore's No. 2 R. L. Crudup, 200 feet east of the NW cor. and located on the north line of Section 19, League 4, Denton County School Lands, A-417.

Wilbarger County

Waggoner Refining Co.'s No. 3 W. T. Waggoner-C, 150 feet south and 780 feet west of the NE cor. of the SW of the NW of Section 44, Block 4, H. & T. C. R. R. Survey.

Winkler County

Atlantic Oil Producing Co.'s No. 2 Grisham-Hunter, 330 feet north and 2,310 feet east of the SW cor. of Section 34, Block B-5, School Lands. G. M. Church and others' No. 1 Ida Hendrick, 330 feet south and 2,310 feet west of the NE cor. of Section 29, Block B-5, School Lands. Humble Oil & Refining Co.'s No. 3 Grisham-Hunter, 330 feet south and 990 feet west of the NE cor. of Section 34, Block B-5, School Lands. Same company's No. 4 Grisham-Hunter, 330 feet south and 1,650 feet west of NE cor. of Section 34, Block B-5, School Lands. Same company's No. 5 Grisham-Hunter, 330 feet south and west of NE cor. of Section 34, Block B-5, School Lands.

Pure Oil Co.'s No. 3 Grisham-Hunter, 2,310 feet north and east of SW cor. of Section 41, Block B-5, School Lands. L. C. Thurman and others' No. 1 Ida Hendrick, 330 feet south and west of NE cor. of Section 29, Block B-5, School Lands.

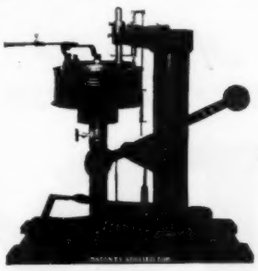
Landreth Production Co. and Roxana Petroleum Corp.'s No. 3 Grisham-Hunt-

"Central" Oil Country Tubular Goods

Large gas companies, after using "Central" Pipe, have commented upon its uniform lengths, perfect roundness, and careful beveling. These sterling qualities in "Central" reduce construction costs by speeding up the field work and, in addition, insure a tight durable line.
For complete satisfaction all around use "Central" Pipe on your next job.

CENTRAL TUBE COMPANY
General Offices—First National Bank Bldg.
PITTSBURGH

Representatives in the Oil Fields
Mid-Continent: Allen, Sproull & Allen, Burk Burnett Bldg., Fort Worth, Texas
California: E. C. Saul, Monadnock Bldg., San Francisco, California.
DISTRIBUTORS: Taubman Supply Corporation, Tulsa, Oklahoma, and branches; Dunigan Tool & Supply Co., Breckenridge, Texas, and branches; Putnam Supply Company, Putnam, Texas, and branches; Louisiana Iron & Supply Co., Shreveport, La., and branches; Petroleum Equipment Co., Los Angeles, California, and branches; American Supply Co., Mexia, Texas; Standard Supply Co., Inc., Wichita Falls, Texas.



Save
—time
—labor
—money
with a
UNIVERSAL PIPE FITTINGS TESTING MACHINE

Put one or more Universals on the job testing your fittings. It will tell you positively and quickly whether they are perfect or imperfect. (Tests have shown that from 30 to 96% of all new fittings are imperfect.) To know this before the fittings are put on the job will save you the expensive burden of tearing down and replacing. Especially adapted to testing meter swivels, pipe saddles, couplings, straight and angle valves, tees, ells, crosses and stop cocks. Can be adjusted to test practically every size and shape fitting up to 4". *Ask for full details.*

Fernholtz Machinery Company
"Leaders Since 1883"
2053 East 38th St. Los Angeles, California
Pacific Coast Representative for { W. A. Riddell Co., Successors to Hadfield-Penfield Steel Co., Bucyrus, Ohio; Crossley Machine Co., Trenton, N. J.

Old Line High Pressure Oil Country Boilers

Buy a Brownell and you will get a boiler of accurately known strength, predetermined margin of safety, high operating efficiency, and extra long life.

Pioneers back in the 50's. Builders of an outstanding product today. Hundreds of oil country installations as reference.

Get Bulletin B-7 at once.

Brownells comply with A. S. M. E. and all State codes.

THE BROWNELL COMPANY, Dayton, Ohio
Domestic Distributors Dunnigan Tool & Supply Co., Inc., Breckenridge, Texas
Export Division Oil Field Machinery Co., 90 West St., New York, N. Y.

BROWNELL BOILERS

STEEL PLATE CONSTRUCTION
Steel Oil Storage Tanks, Condensers, Stills, Refinery equipment of every kind, Fabricated and Erected
RITER-CONLEY COMPANY
General Offices—Pittsburgh, Pa.

BE SURE!

Regardless of the big demand at premium price for extra copies of the June 16 Natural Gas Issue, not one copy was sold until regular subscribers received their copies.

Always renew your subscription promptly and you will be absolutely sure of getting your Oil and Gas Journal every week, especially the big feature issues.

The OIL and GAS JOURNAL
PRODUCING REFINING MARKETING
"The Oil Man's Bible"
TULSA, OKLA.

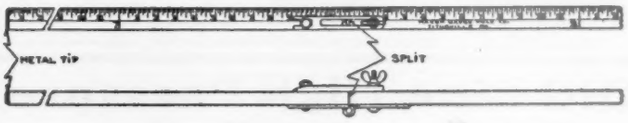
the World's Best DETEX *A type for every purpose*

WATCHCLOCKS

DETEX WATCHCLOCK CORPORATION
BOSTON-23 BEACH ST. ◆ CHICAGO-4147 RAVENSWOOD AVE. ◆ NEW YORK-76 VARICK ST.

GAUGE POLES

Any Length For Oil Measurements



"MARSH-JOINT"

For sale by oil country supply houses or furnished promptly by the factory at Titusville, Pa.

Correspondence Solicited

MARSH GAUGE POLE COMPANY
TITUSVILLE, PA.

Specialists in
Natural Gas Financing

ZWETSCH, HEINZELMANN & CO.
INC.
57 William Street, New York
Telephone, John 3676

er-A is in the SE cor. NE SW, Section 29, Block B-5. Eastland Oil Co. and Arnold's No. 1 Grisham-Hunter is 2,640 feet from north and 2,310 feet from west lines, Section 35, Block B-5.

Wise County

Orbit Oil Co.'s No. 1 Fred Milligan, 600 feet southwest of the northeast line and 600 feet southeast of the southeast line of the Matthew Dunn Survey and located in the Chris C. Williams Survey.

In Fisher County, Cranfill & Reynolds' No. 1 J. A. Young is 990 feet from north and east lines of Section 208, Buffalo Bayou, Brazos & Colorado Survey.

In Ector County, The Texas Company and Cosden's No. 1 W. E. Connell is in the SE cor., Section 24, Block B-16, School Land.

In Loving County, Lockhart Brothers' No. 1 fee is 660 feet from south and 4,220 feet from east lines, Section 85, Block 33, H. & T. C. Survey.

In Upton County, Humble Oil & Refining Co.'s No. 7 Ricker is corrected to location 2,310 feet from NE line and 7,150 feet from NW line of Section 5, Mary S. Denton Survey.

In Glasscock County, California Co.'s No. 2 W. B. Currie, Lease 1, is NE cor. NW, Section 213, Block 29, W. & N. W. Survey.

In Runnels County, Miles Oil Co's No. 1 Charles Ray is 330 feet from north and 600 feet from east lines of SE of Section 71, T. & N. O. Survey.

In Jones County, W. G. Stough's No. 1 W. C. Bennett is 1,070 feet from south and 150 feet from west lines of SE, Section 42, Orphan Asylum Land. It is rigging up spudder.

In Nolan County, Reiter-Foster Oil Co.'s No. 1 T. E. Arledge is 1662 feet from south and 1,347 feet from east line, Section 217, Block 1, H. & T. C. Survey.

Corrected Locations

Archer County: Jeffers & Jeffers' No. 1 W. L. Andrews-C, 150 feet south and west of NE cor. of Chambers-Dobbs Subdivision, G. C. Frarley Survey, A-129.

Brown County: W. T. Daniels and others' No. 1 Mrs. R. E. George, 1,220 feet north and 892 feet east of SW cor. of B. S. & F. Survey No. 33, A-133. Sinclair Oil & Gas Co.'s No. 6 M. L. Smith, 751 feet north and 161 feet west of the SE cor. of the east 20 acres of the south 340 acres of Section 1, S. A. & M. G. Survey, A-849.

Callahan County: Sterling Oil Co.'s No. 1 P. G. Hatchett, 150 feet south and east of NW cor. of the east 50 acres of the S half of NE of Section 24, Deaf & Dumb Asylum Lands.

Comanche County: J. F. Carter and others' No. 1 N. J. Cogburn, 150 feet south and east of the NW cor. of Lot No. 20, J. P. Stephenson Survey. C. O. Moore's No. 1 S. J. Strickland, 150 feet north and west of SE cor. of the north 42 acres of the south 174 acres of the S. J. Strickland tract out of the J. P. Stevenson Survey No. 3.

Howard County: Magnolia Petroleum Co.'s No. 5 Mary Chalk, 2,310 feet south and west of the NE cor. of Section 124, Block 29, W. & N. W. Survey. Same company's No. 8 Otis Chalk, 660 feet north and east of the SW cor. of Section 114, Block 29, W. & N. W. Survey. Texon Oil & Land Co. & Marland Oil Co.'s No. 2 W. R. Settles, C of NW of Section 159, Block 29, W. & N. W. Survey.

WEST TEXAS DAILY AVERAGE PRODUCTION
Week Ending October 8, 1927
Crane County
Church-Fields-McElroy Pool

Company and Lease—	Wells	Prod.
Church and others:		
University	1	101
Church & Weekley:		
University	3	1,607
Church & Fields:		
Duoil-Univ.	1	158
Eastland Oil and Collett:		
University	8	13,572
Gulf Prod. Co.:		
All leases	60	21,516
Humble O. & R. Co.:		
University	11	6,361
Independent O. & G. Co.:		
Universi y-A	2	478
University-B	1	419
Landreth Prod. Corp.:		
Cowden-Anderson	15	14,368
Magnolia Pet. Co.:		
Univ.-Hardwicke	3	3,726
Univ.-O'Keefe	10	1,050
State-Lasseter	3	52
Magnolia Pet. et al:		
University	4	91
Pecos Oil Co.:		
University	10	4,671

PETROLEUM
Development and Technology in 1926

"Enclosed please find money order in payment for the annual record of your symposium on Petroleum. I have several of these annual productions in my possession and find them invaluable for reference."

This is what the manager of one of the largest oil companies wrote when sending for the volume, and is typical of the comments which come in from oil men generally.

Over 240 of the foremost petroleum engineers contributed to this volume. Every topic of vital interest is found in its 970 pages - - - subjects of such timely interest as

"Some New Aspects of the Gas Lift"
"Economic Aspects of Desulfurization in the Refining of Cracked Motor Fuels"
"The Economics of Gasoline"
"Scale and Corrosion Problems in Gasoline Plants"
"California Practice in Transmission of Highly Viscous Oils Through Pipe Lines"

If you're an oil man, you can't afford to be without this book.

Cloth Bound $6.00

American Institute of Mining and Metallurgical Engineers
29 West 39th St., New York City

Treating Plant Quickly and Cheaply Installed

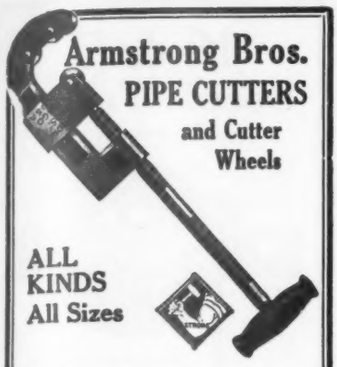
Using equipment already on the lease, you can soon arrange a plant for treating any quantity and any variety of "cut oil" with—

Tret-O-Lite

There is no heavy investment. Sufficient treating capacity for flush production does not penalize the operator at a later period.

WM. S. BARNICKEL & CO.
St. Louis, Mo.

Tret-O-litE



Armstrong Bros.
PIPE CUTTERS
and Cutter Wheels

ALL KINDS All Sizes

Equipped with Armstrong Bros. Improved Knife Blade Cutter Wheels made from ALLOY TOOL STEEL.

Write for free catalog

ARMSTRONG BROS. TOOL CO.
6 No. Francisco Ave. Chicago, U.S.A.

J. Edward Jones
342 Madison Avenue
New York City

FOR SEVERAL YEARS
a
Constant Purchaser
of
OIL PRODUCING ROYALTIES
in
Oklahoma and Kansas

Banking Connections
and
Field Representatives
throughout the
Mid-Continent

PRIMM OIL ENGINES

FOR DRILLING
PUMPING AND
PIPE LINE WORK

Hundreds are now used in the oil fields. Their satisfactory operation for years is the best recommendation to you.

—WRITE—

THE POWER MFG. CO.
722 Cheney Ave.,
MARION, OHIO

"Oil Engine Builders for a Quarter Century"

Prairie O. & G. Co.:		
University	5	59
State-Lasseter	4	4,281
Simms and Atlantic:		
University-A	8	5,156
University-B	1	38
Universi y-C	8	24,396
University-D	7	4,221
University-E	1	178
Stidham & Thrasher:		
University	1	10
The Texas Company:		
University	1	245
Univ.-Beasley	1	32
Tidal Oil Co.:		
University-B	2	76
University-C	1	30
University-E	1	80
University-F	7	5,423
University-G	2	490
University-H	2	48
University-I	3	4,107
Total Church-Fields-McElroy.	193	117,040
Average per well		606
Miscellaneous Crane County		
Gulf Prod. Co.:		
Waddell	1	30
Independent O. & G. Co.:		
Hughes	1	7
McMan O. & G. Co.:		
Hughes	2	78
Marland Oil Co.:		
All leases	16	742
The Texas Company:		
King	9	240
Union Land-F	1	7
Total miscellaneous	30	1,104
Grand total Crane Coun.y	223	118,144
Average per well		530
Crockett County		
Cromwell et al:		
Powell	3	125
Cushing R. & G. Co. (formerly P. H. Williams):		
Powell	1	279
Gulf Prod. Co.:		
Powell	6	451
J. K. Hughes Dev. Co.:		
Powell	5	243
Humble and Marland:		
Powell	9	101
Humble O. & R. Co.:		
Sorg	1	0
Powell-B	3	501
Republic Prod. Co.:		
Powell	2	150
Roxana Pet. Corp.:		
Powell	1	17
Taylor-Link Oil & Kirby Oil:		
Powell	1	100
Total Crocket County	32	1,967
Average per well		61
Ector County		
The Texas Company and Cosden:		
Connell-A	1	14
Glasscock County		
Texon and Marland Oil:		
Settles	2	300
Howard County		
Bristow & Merrick:		
A. J. Hooks	3	63
Comet Pet. Co.:		
H. R. Clay	2	25
Dixie Oil Co.:		
H. R. Clay	1	10
F. H. E. Oil Co.:		
John Roberts	1	58
Godley Oil Co.:		
A. J. Hooks	1	80
Gulf Prod. Co.:		
Chalk	2	12
Harrison et al:		
Dora Rober s	1	20
Humble O. & R. Co.:		
Douthit	2	35
Lockhart & Co.:		
Chalk & Scott	7	93
Magnolia Pet. Co.:		
All leases	34	1,064
Marland Oil Co.:		
All leases	32	1,158
Marland and Group 1 Oil:		
Harding	1	24
Midwest Exp. Co.:		
H. R. Clay	2	53
Owens & S oan:		
John Roberts	1	25
Pure Oil Co.:		
Chalk & Hooks	4	295
Reeves & Apperman:		
H. R. Clay	2	130
Tidal Oil Co.:		
Otis Chalk	2	40
Total Howard County	98	3,185
Average per well		32
Jones County		
Atlantic O. P. C.:		
Howell	1	3
Marland Oil Co.:		
Mason	3	347
Midwest Exp. Co.:		
Thornton	4	200
Phillips Pet. Co.:		
Tessie-Walling	4	281
Joe Winter	3	310
R. M. Beasley	1	75
J. C. Mason	1	160
H. B. Ves.al	1	89
Stebbins Oil Co.:		
Higgs	1	15
Total Jones County	19	1,480
Average per well		78
Loving County		
Lockhart & Co.:		
Allen	1	20
Mitchell County		
Atlantic O. P. Co.:		
Womack	8	220
California Co.:		
All leases	95	2,538
F. J. Carey:		
E. Morrison	1	20
Eastland Oil Co.:		
All leases	9	177
Magnolia Pet. Co.:		
All leases	22	597
Tidal Oil Co.:		
Both leases	2	32
Total Mitchell County	137	3,584
Average per well		26
Pecos County		
Allsman & Bell:		
River Bed	1	92
California Co.:		
Yates	1	932

McGREGOR
"The Working Barrel That Works"

Over sixty thousand now in use from Pennsylvania to Argentine and from Oklahoma to India wherever oil is produced.

No Barrel can compete with the McGregor in price and saving. It comes with the barrels, valves, valve stem all complete at a price slightly more than what the old style Barrel would cost. Pumps as fast as old style barrels that are attached to the tubing.

The only pulling done when you have a McGregor in use is the rods as the complete Barrel is fastened to the rods and comes out when they are pulled. TUBING PULLING is done away with as far as the Working Barrel is concerned. Made for all size tubing. Use "Mac" Ball and Seat.

See your dealer or write us for circular

In ordering parts refer to these letters

McGREGOR WORKING BARREL CO., Inc.
Sole Manufacturers
BRADFORD, PENNA.

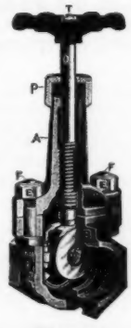


Fig. 460
I. B. Pilot Gate Valve, Sizes ¼" to 3"—125 lbs. W.S.P.

POWELL VALVES

Are always used to advantage for initial installations and replacements demanding ECONOMY in service.

Powell Iron Body Pilot Gate Valves are obtainable with bronze working parts or all iron for special requirements.

Stem is furnished with long acme thread same as used on all Powell Valves. Discs are made with ball and socket back and self-adjusting to seating surfaces.

Special features for long uninterrupted service are built into every Powell product.

THE WM. POWELL COMPANY
2521-2531 Spring Grove Ave.,
Cincinnati, Ohio

Ajax Bull Ropes

Mid-Continent Sales Distributors:
Bisett & Brown
1007 Jones Street
Fort Worth, Texas

Warehouse Representative:
H. D. Hedrick
Tulsa Transfer & Storage Co.
Tulsa, Okla.

Ajax ropes are carried in stock by the North Texas Supply Co., Cross Plains, Tex.; Rex Supply Co., Sour Lake, Tex., and Mid-Continent Supply Co., Fort Worth, Tex.

THE COLUMBUS FORGE & IRON CO.
Manufacturers of

Superior Forged Pipe Tongs—Oil Well Tool Wrenches—Box and Pin Forgings—Hooks—Vises—Wrought Anvils and other Oil Well Tools

Our Tongs are made of the best material—they will grip the pipe and stand the test for strength.

In our finely equipped Drop Forging Department we manufacture forgings of the better quality from as small as ¼ ounce up to 10,000 pounds.

Write us your requirements.

COLUMBUS, OHIO

Gott Water Can or Gottkool

Built to last—you will always be assured of a fresh supply of pure water, when you have a GOTT. Made in 1½, 3, 5 and 10 gallon sizes. Order now from your supply store.

H. P. GOTT MFG. CO.
Winfield, Kansas

Gulf Prod. Co.:		
M. A. Smith	1	472
Humble O. & R. Co.:		
M. A. Smith	1	400
Marland Oil Co.:		
Yates-A	1	600
McMan and Marland:		
Yates	3	914
Mid-Kansas and Transcontinental:		
Smith-Taylor	1	527
Yates-A	7	2,093
Yates-B	3	1,783
Yates-C	1	268
Red Bank Oil Co.:		
Smith	1	20
Roxana Pet. Corp.:		
Tippett	1	2,080
Simms Oil Co.:		
Smith	1	2,605
Texon O. & L. Co.:		
Yates	1	0
Total Pecos County	24	12,786
Average per well		532
Reagan County		
Big Lake Oil Co.:		
University	117	18,310
Texon O. & L. Co.:		
University	79	5,520
Total Reagan County	196	23,830
Runnels County		
Ladd, Sillix et al:		
McMillan	1	125
Scurry County		
Northwest Oil Co.:		
All leases	5	45
Upton County		
Amerada Pet. Corp.:		
Hughes	6	349
Atlantic O. P. Co.:		
Sherk	1	35
Bryant and Atlantic:		
Baker	2	29
Champlin O. & R. Co.:		
Lane	1	516
Dixie Oil Co.:		
Burleson	26	2,268
Hughes	10	215
Gulf Prod. Co.:		
All leases	14	2,020
Humble O. & R. Co.:		
Burleson	4	26
Ricker	5	1,317
Independent O. & G. Co.:		
Burleson, Wooley & Taylor	26	672
McMan O. & G. Co.:		
Baker	2	25
Marland Oil Co.:		
All leases	76	2,642
Prairie O. & G. Co.:		
J. P. Lane	4	692
Allie Lane	4	1,341
Pure Oil Co.:		
Lane	1	86
Republic Prod. Co.:		
Baker	6	109
Roxana Pet. Corp.:		
Bowen	26	2,138
Es ep	3	47
Hughes	10	241
Simms Oil Co.:		
Shirley	3	49
Snowden & McSweeney:		
Hughes	1	249
Sun Oil Co.:		
Burleson & Baker	10	211
The Texas Company:		
Burleson	4	34
King	12	425
Perry	3	1,587
Texon O. & L. Co.:		
Sherk	1	15
Tidal Oil Co.:		
Hughes	1	100
Burleson	2	24
Texas Pacific C. & O. Co.:		
Sherk	4	176
Lane-A	10	2,703
Lane-B	1	34
Wentz Oil Corp.:		
Sherk	3	140
White Eagle O. & R. Co.:		
Hughes	1	18
Total Upton County	283	20,743
Average per well		73
Winkler County		
Gulf Prod. Co.:		
Hendricks	1	895
Independent O. & G. Co.:		
Hendricks	1	25
Murchison Oil, Marland Oil and Cranfill Bros.:		
Grisham-Hunter	1	600
Pure Oil Co.:		
Grisham-Hunter	1	925
Southern Crude O. P. Co.:		
T-67 Hendricks-A	1	287
T-67 Hendricks-C	2	696
T-88 Hendricks-A	1	931
T-88 Hendricks-B	1	5,183
Total Winkler County	9	9,542
Average per well		1,060
Grand total West Texas	1,031	195,640
Average per well		189

MYERS WATER SYSTEMS FOR HOMES·FARMS·PUBLIC AND PRIVATE INSTITUTIONS

Myers Self-Oiling Bulldozer Power Pumps for oil and gas field service, for mills, mines and factories—Myers Self-Oiling Water Systems for Homes, Farms, Public and Private Institutions—tell us your requirements. We are the world's headquarters for Pumps for every purpose. Ask your supply house, your jobber, your dealer or write us direct. Catalog mailed promptly on request.

THE F. E. MYERS & BRO. CO. Ashland, Ohio
—ASHLAND PUMP AND HAY TOOL WORKS—

CARBON (BLACK DIAMONDS) FOR DIAMOND CORE DRILLS

—IMPORTERS—
INDUSTRIAL DIAMONDS
—MANUFACTURERS—
DIAMOND POINTED TOOLS FOR ALL MECHANICAL PURPOSES

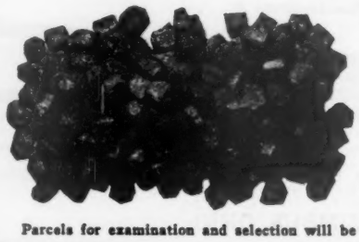
WRITE OR WIRE FOR CATALOGUE AND FULL PARTICULARS
THE DIAMOND DRILL CARBON CO.
61 PARK ROW, NEW YORK, N.Y. CABLE ADDRESS, CREDOTAN, N.Y.

WIRE FOR INFORMATION

Regarding 10,000 acre drilling block on excellent structure, near good oil shows, off structure, seven miles south where Mid-Kansas, discoverer of Yates, just spudded first of three blocks Brewster County. Chance for shallow production. Conditions easily explained. Require immediate action. Best bet we have seen in year. Have had brokerage and consulting geology offices.

COFFEY & WARNER
Ft. Stockton, Texas

U. S. INDUSTRIAL DIAMOND CORP.



475 Fifth Ave., New York

Importers of all varieties of Industrial Diamonds

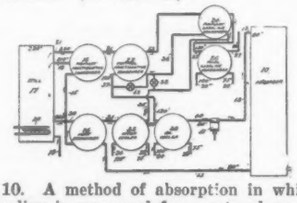
Carbon (Black Diamonds) and Bort (Crystalline Diamond) for Diamond Core Drilling

Best shapes and qualities always in stock.

Parcels for examination and selection will be sent on request to reliable firms.

Recent Patents

1,640,747. Absorption Plant. Carl F. Braun, Pasadena, Calif. Filed February 7, 1923. Serial No. 617,494. 11 Claims. (Cl. 196—8.)



10. A method of absorption in which gasoline is recovered from natural gases, which consists in saturating a denuded menstruum in an absorber, thereafter carrying the saturated menstruum to a

K & E Steel Tapes for *exact* measurements

GUARANTEED Accuracy and easy operation make K & E Tapes the logical ones to use. Our "Keco" *rust-resisting finish,* increases the life of the tape line.

The illustration shows our

No. 7142-T for Oil Gauger's use.

We carry tapes for gauging both *high* and *low* gravity oils.

Tape Catalog Free
Send for It Today!

KEUFFEL & ESSER CO.
NEW YORK, 127 Fulton Street, General Office and Factories, HOBOKEN, N. J.
CHICAGO 116-20 S. Dearborn St. ST. LOUIS 817 Locust St. SAN FRANCISCO 23-24 Second St. MONTREAL 5 Notre Dame St. W.
Drawing Materials, Mathematical and Surveying Instruments, Measuring Tapes

Quite Natural

As The Oil and Gas Journal leads in everything, it is quite natural that it should have the best petroleum publication classified section.

It is read with respectful consideration every week by thousands of oil men in all fields, refineries, pipe line stations, gasoline plants, supply houses and offices everywhere.

Whenever you want to buy or sell leases, production, royalties or equipment advertise in the Classified Wants Section. A 30-word advertisement can be run a month for $5.50.

The Oil and Gas Journal
TULSA, OKLA.

DIVIDEND NOTICE
Imperial Royalties Company

Will pay monthly dividend of 1½% to Preferred Shareholders on October 31. This is Dividend No. 85, and makes a total of 148% paid to shareholders.

E. S. HORN,
H. O. BLAND,
J. E. HORN, Trustees.
336 Mayo Building, Tulsa, Okla.

Amarillo's
Two Great Hotels

Amarillo Hotel
400 rooms—300 baths
Rates, $2.00 to $3.50

Herring Hotel
600 rooms—600 baths
Rates, $2.50 to $5

Ernest Thompson Hotels—Built on good food!
Antro Hotel, Clarendon, Tex.
Panhandle Inn, Panhandle, Tex.
Memphis Hotel, Memphis, Tex.
Wilberger Hotel, Vernon, Tex.

GEORGE K. STAYTON
Attorney at Law
Oil and Gas and Land Practice in Winkler County Field
Pyote, Texas

ARTHUR C. BROWN
SOLICITOR OF UNITED STATES AND FOREIGN PATENTS
406-412 KENNEDY BLDG.
Tulsa, Okla.
Mr. Fred Krueger in Charge
Phone 4-2319

EDWIN B. HOPKINS
CONSULTING GEOLOGIST
25 Broadway
NEW YORK

Chester W. Washburne
Geologist and Engineer
27 William St., N. Y.

PATENTS *Write for Free Book*
MUNN & CO.
Associated for 81 years with the Scientific American
1551 Scientific American Building
24 West 40th Street, *New York City*
514 Scientific American Bldg., *Washington, D.C.*
1303 Tower Building, *Chicago, Ill.*
636 Hobart Building, *San Francisco, Cal.*
511 Van Nuys Building, *Los Angeles, Cal.*

TEXAS OIL MAPS
County and District Catalog on Application
HEYDRICK MAPPING COMPANY
Wichita Falls, Texas

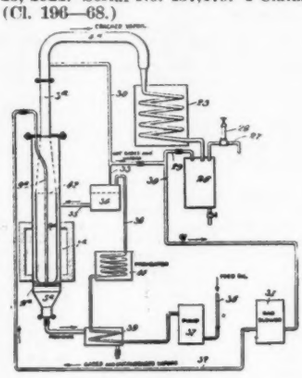
KORK KELLEY
Pipe Line Contractor
Any Size—Any Length
Amarillo—Borger, Texas

S. F. SHAW
Mining Engineer
Consulting Work in Air and Gas Lifts
301 Terrell Road,
San Antonio, Texas

OIL MAPS
Panhandle, West Texas, Western Oklahoma, New Mexico
AMARILLO ABSTRACT CO.
Amarillo, Texas

still where its vapors are given off at a relatively high temperature, and then condensing said vapors using water as a final cooling agent and employing the absorbing menstruum as an intermediate agent between the still and the final vapor cooling water condenser at a temperature below the scaling temperature of the water.

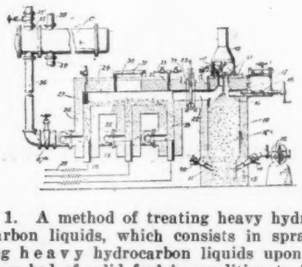
1,640,444. Process and Apparatus for Cracking Hydrocarbon Oils. Warren F. Faragher and William Arthur Gruse, Pittsburgh, Pa., assignors to Gulf Refining Co., Pittsburgh, Pa., a corporation of Texas. Filed January 15, 1921. Serial No. 437,479. 4 Claims. (Cl. 196—68.)



1. The method of cracking oils, which comprises subjecting a body of oil in a still to the action of heated surfaces and thereby heating the oil to a cracking temperature under pressure and introducing a current or currents of gas, acting on the "air lift" principle, in upwardly directed jets in an upwardly directed passage within the body of oil, the gaseous current or currents being made up of gases produced during the cracking operation.

3. An apparatus for cracking oils, comprising a still provided with heating means for heating the oil therein to a cracking temperature under pressure, means for withdrawing gases from the still, and means for reintroducing a gaseous current or currents comprising a portion of the same into the still in upwardly directed jets, acting on the "air lift" principle, near the lower end of an upwardly directed circulation pipe arranged in the still and adapted for coacting with the gaseous current or currents for effecting circulation of the oil over the heating surfaces of the still.

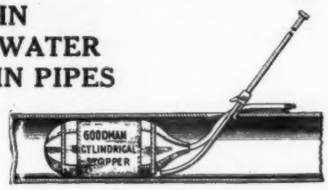
1,643,401. Process for Manufacturing Light Hydrocarbon Liquids. Willis S. Yard and Earl Newman Percy, Oakland, Calif. Filed March 17, 1924. Serial No. 699,616. 3 Claims. (Cl. 196—61.)



1. A method of treating heavy hydrocarbon liquids, which consists in spraying heavy hydrocarbon liquids upon a deep bed of solid fuel in condition to incandescence and contained within a closed chamber, whereby the liquid will come into intimate contact with the fuel and will be vaporized, thereafter passing the vapors into a second chamber over a mass of finely divided carbonaceous material electrically heated to incandescence, subjecting the vapors and the carbonaceous material to the action of steam to prevent plugging of the carbonaceous material with the products of cracking, and then passing the vapors through the carbonaceous material to bring them into intimate contact with the particles of the heated carbon and thus bring about a cracking action of the vapors.

RYERSON
IMMEDIATE SHIPMENT FROM STOCK
Bars, Plates, Rivets, Tool Steel, Shapes, Sheets, Bolts, Welding Rods, Structurals, Tubes, Wire, Concrete Reinforcing, Rails, Pipe, Turnbuckles, Alloy Steel, Ascoloy, Small Tool, Machine Tools, etc.
Write for the Ryerson Journal and Stock List.
JOSEPH T. RYERSON & SON INC.
Chicago Detroit Milwaukee Buffalo St. Louis New York Cincinnati Cleveland Boston
Tulsa Office: 410 Atlas Life Bldg.
STEEL
Houston Office: D. S. Mair 220 Main Street

FOR USE IN GAS, OIL, WATER AND DRAIN PIPES



SAFETY GAS MAIN STOPPER CO.
523 Atlantic Ave., Brooklyn, N. Y.

Reproduction of One-Piece Banner 40 Inches by 20 Feet Produced for The Skelly Oil Co. Eldorado Kans.

Advertise Your Products thru Effective Signs on Filling Stations. We Specialize in such banners Printed on Muslin with Fast Colors

Posters
Banners
Display Cards
Broadsides
Folders

QUIGLEY LITHO. CO.
Designers Printers Engravers
115-117-119-121 West 5th St. Kansas City, Mo.

Protect your Oil and Natural Gas Lines with
BITUMASTIC
REG. U.S. PAT. OFF
ENAMEL
Write for our new book "The Protection of Pipe Lines"
Wailes Dove-Hermiston Corporation
17 Battery Place, New York
1 No. Frankfort St., Tulsa, Okla.
Philadelphia Cleveland Chicago San Francisco

HARRY A. CAMPBELL F. LEE STEWART
NATIONAL PETROLEUM ENGINEERING COMPANY
ENGINEERS AND GEOLOGISTS
ATLAS LIFE BUILDING
TULSA, OKLAHOMA
APPRAISALS
REPORTS, COMMERCIAL AND TAX
SURVEYS
ESTIMATES OF OIL RESERVES

See Classified Wants on Pages 156-157

Oklahoma-Kansas and Eastern Pipe Line Report

OKLAHOMA-KANSAS

Pipe Line Statement for August Runs

	Month	Daily Av.
*Prairie P. L. Co.	4,495,000	145,000
Gulf P. L. Co.	1,285,908	41,481
Texas P. L. Co.	1,169,558	37,727
Magnolia Pet. Co.	1,990,209	64,200
Empire P. L. Co.	1,961,375	63,270
Cosden P. L. Co.	1,227,893	39,609
*Sinclair P. L. Co.	2,821,000	91,000
Oklahoma P. L. Co.	3,888,711	125,442
*Other lines	11,129,000	359,000
Total August	29,968,654	966,729
Total July	29,969,289	966,751
Difference	635	22

Shipments

†Prairie P. L. Co.	5,786,822	186,672
Gulf P. L. Co.	1,246,707	40,216
Texas P. L. Co.	1,007,035	32,485
Magnolia Pet. Co.	1,678,981	54,161
Empire P. L. Co.	1,588,178	51,231
Cosden P. L. Co.	1,044,043	33,679
†Sinclair P. L. Co.	2,901,494	93,596
Oklahoma P. L. Co.	3,792,555	122,340
*Other lines	8,680,000	280,000
Total August	27,725,815	894,380
Total July	27,442,873	885,253
Difference	282,942	9,127

Stocks

*Prairie O. & G. Co.	30,275,000
*Prairie P. L. Co.	2,500,000
Gulf P. L. & Gypsy Oil Co.	3,409,574
The Texas Company	4,641,172
Magnolia Pet. Co.	6,141,909
Empire P. L. Co.	4,222,231
Cosden P. L. Co.	2,910,325
*Sinclair Crude Oil Pur. Co.	19,800,000
Oklahoma P. L. Co.	2,312,483
Carter Oil Co.	15,960,294
*Other lines	10,200,000
Total August	107,372,988
Total July	106,141,422
Difference	1,231,566

*Estimated. †Sinclair P. L. runs include Texas and Wyoming crude oil. Prairie P. L. shipments include Texas crude oil.

Note—Stocks do not include approximately 5,250,000 bbls. of crude oil held in storage on private tank farms and leases, and approximately 1,650,000 bbls. of Texas Panhandle crude oil held in storage in Oklahoma and Kansas.

EASTERN PIPE LINES

Runs from Wells

In the following table will be found the regular receipts from wells by various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for July and August:

	July, '27	Aug. '27
Nat. Transit	155,782.70	146,479.36
S. W. Pa. P. L.	85,622.92	86,648.22
Eureka P. L.	378,082.34	396,237.28
Buckeye P. L. (Macksburg)	319,986.32	343,331.35
Buckeye P. L. (Cleve)	11,219.55	11,953.28
Buckeye P. L. (Lima, etc.)	126,613.83	129,837.26
Indiana P. L.	9,105.05	8,905.59
Cum'land P. L.	261,377.90	267,515.04
N. Y. Transit	22,974.99	25,028.15
Tidewater P. L.	185,203.72	197,502.70
Pure Oil	157,734.23	164,866.70
Emery P. L.	54,637.01	59,569.14
Paragon Dev.	28,004.42	30,553.66
Pgh. P. L.	5,520.99	4,324.41
Stoli Oil Ref.	14,358.01	14,331.15
Total	1,815,303.91	1,886,983.19
Daily average	58,574.32	60,870.42

Note—Indian Refining Co. also reported other receipts of 415,944.89 bbls. Paragon Refining Co. had other receipts of 175,142.86 bbls. Paragon Development had other receipts of 818.77 bbls. Pure Oil had other receipts of 25,375.12 bbls.

Petroleum Deliveries

The following tables exhibit the shipments or regular deliveries of various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for July and August:

	July, '27	Aug. '27
Nat. Transit	330,044.32	344,779.78
S. W. Pa. P. L.	363,850.84	343,310.98
Eureka P. L.	183,351.51	198,756.14
Buckeye P. L. (Macks. urg)	175,567.01	153,543.57
Buckeye P. L. (Cleve)	971.94	737.48
Buckeye P. L. (Lima, etc.)	954,040.89	748,093.86
Indiana P. L.	1,038,598.35	868,709.30
Cum'land P. L.	139,659.15	150,233.42
N. Y. Transit	364,628.62	389,844.19
Northern P. L.	200,019.17	196,331.58
Tidewater P. L.	105,016.04	150,113.65
Pure Oil	165,167.69	205,913.45
Emery P. L.	57,048.51	54,557.91
Paragon Ref.	176,876.21	177,675.03
Indian Ref.	400,446.10	379,066.52
Paragon Dev.	29,982.32	31,192.30
Pgh. P. L.	5,593.24	5,395.27
Total	4,691,862.02	4,298,243.43
Daily Average	151,350.39	138,653.01

Gross Stocks

The gross stocks held by various pipe lines in the oil producing sections of New York, Pennsylvania, West Virg.nia, Ohio, Indiana and Kentucky, at the close of July and August:

	July, '27	Aug. '27
Nat. Transit	1,137,052.50	1,139,180.77
S. W. Pa. P. L.	684,337.22	683,586.32
Eureka P. L.	1,859,908.44	1,949,985.99
Buckeye P. L. (Macksburg)	407,391.62	416,688.37
Buckeye P. L. Cleve.)	36,605.62	39,918.38
Buckeye P. L. (Lima, etc.)	4,280,952.96	4,668,115.54
Indiana P. L.	618,014.38	620,872.22
Cum'land P. L.	579,849.28	591,843.81
Southern P. L.	433,210.34	429,471.58
N. Y. Transit	419,558.02	460,922.97
Northern P. L.	487,732.61	470,103.63
Pure Oil	412,670.10	395,429.71
Emery Pipe	7,901.54	13,506.50
Paragon Ref.	18,557.87	15,696.20
Indian Ref.	58,707.96	93,156.64
Paragon Dev.	6,514.28	6,821.39
Pgh. P. L.	4,163.23	3,864.26
Total	11,453,127.97	11,989,115.18
Decrease	40,646.24	
Increase		535,987.21

Grades of Oil

The following table shows the amount of the different grades of oil held by the Eastern pipe lines at the close of July and August showing the gross stocks of the above fields:

	July, '27	Aug. '27
Penna.	4,190,178.95	4,238,474.19
Lima	1,006,906.85	1,018,062.71
Kentucky	1,129,805.76	1,134,629.10
Mid-Cont.	5,079,649.41	5,531,964.28
Illinois	46,587.00	65,984.90
Total	11,453,127.97	11,910,115.18

Daily Average Runs

The following table shows the daily average runs of the Pennsylvania, Lima and Kentucky oil fields for the past four years:

	1924	1925	1926	1927
Jan.	62,638	56,831	55,630	56,209
Feb.	63,023	60,506	60,294	61,298
March	68,721	60,576	61,644	63,247
April	71,058	63,962	63,019	60,327
May	63,942	59,317	60,530	60,284
June	63,230	61,270	64,131	62,757
July	64,208	62,639	63,206	58,574
Aug.	59,942	59,686	61,815	60,370
Sept.	62,930	62,510	64,639	.....
Oct.	64,976	60,995	62,704	.....
Nov.	56,282	59,350	61,774	.....
Dec.	55,814	57,974	58,755	.....

Daily Average Shipments

The following table gives daily average shipments from the Pennsylvania, Lima and other fields for the past four years:

	1924	1925	1926	1927
Jan.	145,518	157,889	156,056	141,327
Feb.	148,732	160,863	159,488	138,534
March	147,098	154,691	150,239	133,777
April	147,611	151,429	152,371	140,227
May	134,997	146,995	160,998	144,894
June	142,010	149,467	160,257	149,772
July	124,187	161,338	160,245	151,350
Aug.	123,120	161,730	151,929	138,653
Sept.	127,325	156,719	158,915	.....
Oct.	123,170	145,388	161,132	.....
Nov.	124,400	143,582	152,668	.....
Dec.	151,392	150,162	136,436	.....

Gross Stocks

In the following table will be found the gross stocks of the various lines of the Pennsylvania, Lima and Kentucky oil fields, including oil received from other lines at the close of each month for the past three years:

	1925	1926	1927
Jan.	11,353,276	9,859,170	9,718,000
Feb.	11,193,924	9,579,354	10,129,100
March	11,158,227	9,438,292	10,784,000
April	11,062,082	9,805,861	11,112,000
May	11,307,562	9,581,757	11,356,000
June	11,093,796	9,585,904	11,493,000
July	11,067,453	9,734,687	11,458,000
Aug.	10,974,481	9,668,947	11,989,115
Sept.	10,781,753	9,433,732	.....
Oct.	11,086,350	9,369,806	.....
Nov.	11,068,153	9,257,667	.....
Dec.	10,458,445	9,464,512	.....

Franklin Pipe Line Co.

The following table exhibits the condition of the Franklin Pipe Line at the close of business for the months named and not counted in the stocks and averages reported above.

1926—	Runs	Shipments	Stocks
July	3,026,36	4,075.11	13,000,11
August	2,886.59	3,121.31	14,474.64
Sept.	2,788.18	3,378.06	13,906.01
Oct.	2,991.66	2,807.75	14,071.31
Nov.	2,810.60	1,664.56	15,217.31
Dec.	2,847.52	5,561.11	13,103.72
1927—			
Jan.	2,641.54	1,470.42	14,274.84
Feb.	2,764.30	1,082.82	15,956.32
March	2,587.20	1,378.56	16,664.96
April	2,834.23	1,512.65	17,986.54
May	2,768.47	539.29	20,215.72
June	2,946.29	664.40	22,497.61
July	3,153.39	1,276.61	24,374.39

The Illinois Field

The following table gives the report of the Illinois Pipe Line Co. in Illinois:

Runs from wells	621,898.35
Gross stocks, Sept. 1	2,110,150.70
Other receipts	366,647.35
Regular deliveries	500,694.72
Other deliveries	877,647.70

The amount of Illinois oil run by the Tide Water Pipe Co. in August was 29,878.15 bbls. and deliveries were 28,726.64 bbls. Adding these figures to those of the Illinois Pipe Line Co. makes the runs and deliveries as follows:

1926—	Runs	Deliveries
July	713,490.66	490,092.32
August	701,795.92	555,766.59
Sept.	632,798.66	516,083.06
Oct.	651,648.96	531,467.30
Nov.	651,263.33	498,436.37
Dec.	668,909.58	537,947.61
1927—	Runs	Deliveries
January	621,421.02	530,095.98
February	595,831.16	476,950.71
March	727,592.91	554,947.48
April	593,225.97	444,518.40
May	728,759.40	542,192.03
June	640,976.85	532,217.78
July	613,901.30	484,902.53
August	651,376.40	529,351.37

Tide Water Pipe Co., Ltd., also delivered in August, 127,490.55 bbls. of Oklahoma oil.

AVERAGE DAILY RECEIPTS OF CALIFORNIA OIL AT ATLANTIC AND GULF COAST PORTS

Average bbls. per day—	ATLANTIC PORTS						GULF COAST PORTS						
	Baltimore	Boston	New York	Philadelphia	Others	Total	Galveston	New Orleans Baton Rouge	Port Ar.hur Sabine Pass	Tampa	Total	All Ports
April	12,667	4,367	47,667	15,100	13,300	93,100	.....	.....	.....	.....	.....	93,100
May	10,452	7,645	18,387	9,226	6,226	51,936	.....	.....	.....	.....	.....	51,936
June	25,567	11,233	48,833	17,367	17,367	120,367	.....	.....	.....	.....	.....	120,367
July	13,484	17,390	33,065	9,129	5,451	78,419	.....	.....	.....	.....	968	79,387
August	18,516	3,065	48,129	17,323	26,000	113,032	.....	.....	.....	.....	.....	113,032

AVERAGE DAILY IMPORTS OF PETROLEUM AT PRINCIPAL UNITED STATES PORTS

Average bbls. per day—	ATLANTIC PORTS						GULF COAST PORTS					
	Baltimore	Boston	New York	Philadelphia	Others	Total	Galveston	New Orleans Baton Rouge	Port Ar.hur Sabine Pass	Tampa	Total	All Ports
April	22,700	9,033	62,033	8,067	26,567	126,400	5,067	18,033	.....	.....	23,100	149,500
May	21,032	9,807	93,452	7,774	23,580	155,645	1,807	30,612	1,936	.....	34,355	190,000
June	18,167	9,700	83,867	10,900	18,567	139,200	2,000	31,800	.....	.....	33,800	173,000
July	22,226	10,387	80,193	7,193	28,710	158,710	3 226	25,065	806	.....	29,096	187,806
August	19,323	9,032	80,903	14,258	31,821	155,387	2,097	21,161	.....	.....	23,258	178,645

GROSS PRODUCTION OF THE UNITED STATES FOR 12 MONTHS

(IN BARRELS)

		California	Oklahoma	Texas	Kansas	Arkansas	Louisiana	Rocky Mountains	Eastern Fields	Total
1926—										
September:	Month	18,104,954	14,466,510	17,550,100	3,450,060	4,603,230	2,079,840	3,141,123	3,330,000	66,755,817
	Daily average	603,498	482,217	585,003	115,002	153,441	69,328	104,704	111,000	2,225,194
October:	Month	18,906,058	15,720,689	19,001,383	3,714,627	4,635,138	2,166,559	3,071,730	3,393,000	70,664,189
	Daily average	611,808	507,119	612,948	119,827	149,198	69,889	99,088	109,613	2,279,490
November:	Month	19,173,128	16,876,950	18,593,160	3,593,490	4,299,480	2,054,911	3,843,587	3,216,000	70,645,706
	Daily average	639,104	562,565	619,772	119,783	143,316	68,497	94,752	107,200	2,354,990
December:	Month	20,276,950	17,882,908	19,753,591	3,654,156	4,366,189	2,018,734	3,458,301	3,313,000	73,823,829
	Daily average	654,095	576,868	637,213	117,876	137,619	65,120	95,752	106,871	2,381,414
1927—										
January:	Month	20,184,872	19,035,426	18,605,362	3,769,879	4,076,469	1,905,570	2,620,302	3,322,500	73,530,383
	Daily average	651,125	614,046	600,173	121,609	131,499	61,470	84,203	107,500	2,371,945
February:	Month	17,982,711	19,752,248	16,483,712	3,352,076	3,674,256	1,784,104	2,385,135	3,007,200	68,221,542
	Daily average	642,240	705,441	588,704	119,717	127,652	63,718	85,183	107,400	2,440,057
March:	Month	19,835,724	23,480,921	18,232,617	3,675,143	3,853,320	1,982,982	2,476,792	3,325,800	76,923,906
	Daily average	639,862	725,191	588,149	118,553	124,320	63,580	79,574	105,100	2,449,158
April:	Month	19,492,825	22,208,130	17,801,140	3,516,930	3,378,240	1,994,230	2,615,770	3,474,000	74,482,305
	Daily average	648,870	740,271	593,371	117,231	112,608	66,491	87,192	115,800	2,482,745
May:	Month	19,506,054	23,258,463	19,539,033	3,704,314	3,493,669	1,935,175	2,742,588	3,467,000	77,646,346
	Daily average	629,228	750,273	630,298	119,494	112,699	62,425	88,471	111,839	2,504,721
June	Month	19,181,443	23,230,230	18,399,510	3,437,580	3,365,760	1,880,830	2,592,437	3,330,000	75,918,179
	Daily average	639,381	761,011	613,287	114,586	112,192	62,694	86,414	111,000	2,530,606
July:	Month	19,319,021	25,532,546	17,907,194	3,464,082	3,406,632	1,279,405	2,626,607	3,372,000	78,597,488
	Daily average	623,194	823,566	577,974	111,422	109,892	73,529	85,020	108,806	2,535,401
August:	Month	19,279,181	26,283,350	17,715,229	3,424,570	3,242,600	2,199,905	2,630,065	3,603,400	78,383,250
	Daily average	621,907	847,850	571,459	110,470	104,600	70,964	81,615	116,400	2,526,266
	Total 12 months	231,313,870	247,318,571	219,312,387	42,746,917	46,185,634	24,832,235	32,312,334	40,184,900	883,697,948

y,

at
roo

002
162
044
195
181
173
128
115
...
...
...

di-
pac
hot
led

ks
.18
.56
.68
.21
.81
.72

.84
.22
.96
.54
.72
.61
.39

the

.25
.79
.26
.73
.79

de
ia.
ing
ipe
an

ree
.83
.59
.06
.39
.37
.61
ree
.98
.71
.42
.49
.92
.78
.63
.37
red
oil.

=

(
l
rts
100
035
367
287
032

=

(
rts
500
000
000
206
545

=

al
017
194
159
490
706
990
829
414

382
948
642
057
906
186
266
745
846
721
179
606
638
401
250
264

048

Leadership

The responsibilities of ruling one of the world's mightiest nations are exacting—but America has never failed in an emergency to produce a man particularly well fitted to pilot the ship past the danger zone.

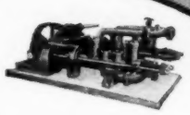
Leadership in the field of oil industry pumps also has its responsibilities. Changing conditions are constantly bringing about the need for new pumping equipment. GASO owes much of its success to the promptness and efficiency with which these needs have been met.

Our 64-page catalog is a handbook of pumping information. Shall we send you your copy?

GASO PUMP & BURNER MFG. COMPANY

Tulsa · Oklahoma

Gaso Model No. 1018 is an exceptionally popular suction pump for use in stations and in the field. It has a large capacity, is sturdily constructed, and offers amazing accessibility of parts.



Model No. 1012 is built especially for high-pressure duty. 130 to 204 gallons capacity against 700 to 900 pound pressures. It thrives on heavy work. For detailed information, ask any pipe-line operator!

GASO PUMPS

for every oil industry need

Serving the Industry with SPEED

HUGHES SELF-CLEANING CONES

Speed in getting the hole down is essential to drilling economy. Since the inception of Hughes "Self-Cleaning" Cones, Operators and Contractors in the Rotary Fields throughout the world have been able to cut their drilling costs per well a worthwhile extent.

"Sold by Supply Stores Everywhere"

HUGHES TOOL CO.

Export Office
Woolworth Bldg.
New York City

Main Office and Plant
HOUSTON, TEXAS

Service Plants
Los Angeles, Calif.
Oklahoma City, Okla.